WATER WORKS & SEWERAGE

HBP ABC

AUGUST 1945

VICTORY NUMBER

AUGUST 1945

MEET THE ANTI-CONTAMINATION DIVISION

Wherever our armed forces are faced with danger of contamination . . . in camp laundries, kitchens, hospitals, shower rooms, footbaths . . . Per*chloro*n is on the job. In addition to these individual tasks, Per*chloro*n offers protection to the water supply of the armed forces, and within the limits of availability, to the water supplies of the nation.

Write today for free Per*chloro*n booklet.

Penn Salt Manufactures

LIQUID CHLORINE

for water sanitation and sewage treatment

Also

Anhydrous Ammonia • Filter Alum
Ferric Chloride • Sodium Aluminate
Chloride of Lime • Caustic Soda
and other products

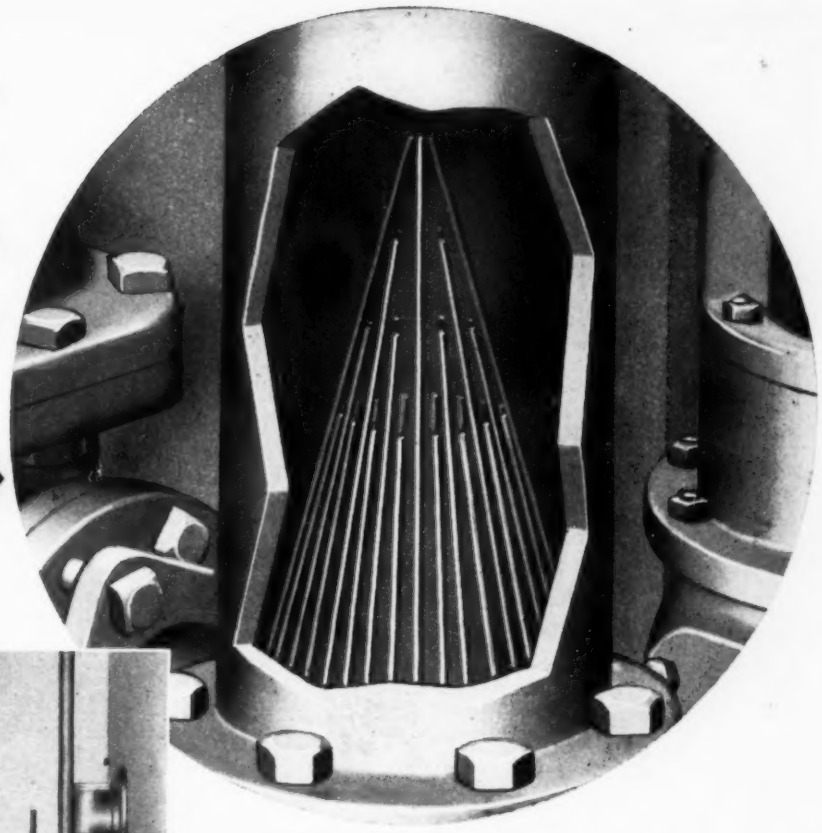
PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

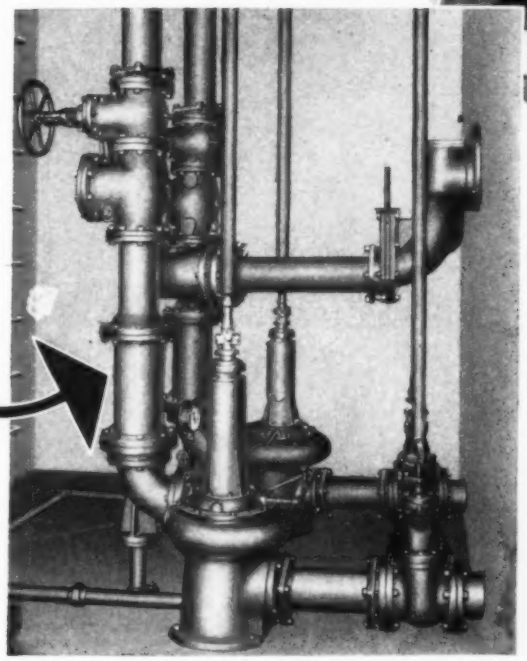
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

New York • Chicago • St. Louis • Pittsburgh • Cincinnati • Minneapolis
Wyandotte • Tacoma

WATER WORKS & SEWERAGE, August, 1945, Volume 92, Number 8. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

THIS STRAINER MAKES "FLUSH-KLEEN" SEWAGE PUMPING SYSTEM CLOG-PROOF





"Flush-Kleen" Sewage Lift Station at Camp Barkeley, Texas

Over 2,000 duplex sets of "Flush-Kleens" are in service on Troop Transports, Aircraft Carriers, Hospital Ships, Cargo Vessels, and at Army Camps, Navy Bases, Air Fields, War Plants, Municipal Sewage Lift Stations and all types of buildings throughout the country.

All coarse sewage matter is retained by the "Flush-Kleen" strainer. The pumps handle strained sewage only, and cannot clog. The strainer is automatically backwashed by the pump discharge, and the coarse matter is flushed to the higher-level sewer line.

"Flush-Kleen" Sewage Pumps are installed in duplex sets and operate alternately. While one pump operates, sewage flows into the wet basin through the idle pump. The "Flush-Kleen" Strainer ahead of the pump impeller retains all coarse sewage matter. Only strained sewage passes through the pump into the wet basin.

When the idle pump starts, the coarse sewage matter in the strainer chamber is flushed out through the discharge pipe with the strained sewage from the wet basin.

A special check valve prevents the operating pump from discharging back into the inlet line.

Operation is automatically transferred from one pump to the other at the end of each pumping period. Both pumps may operate during peak flows, however, at which time the inflow is through an overflow strainer in the wet basin.

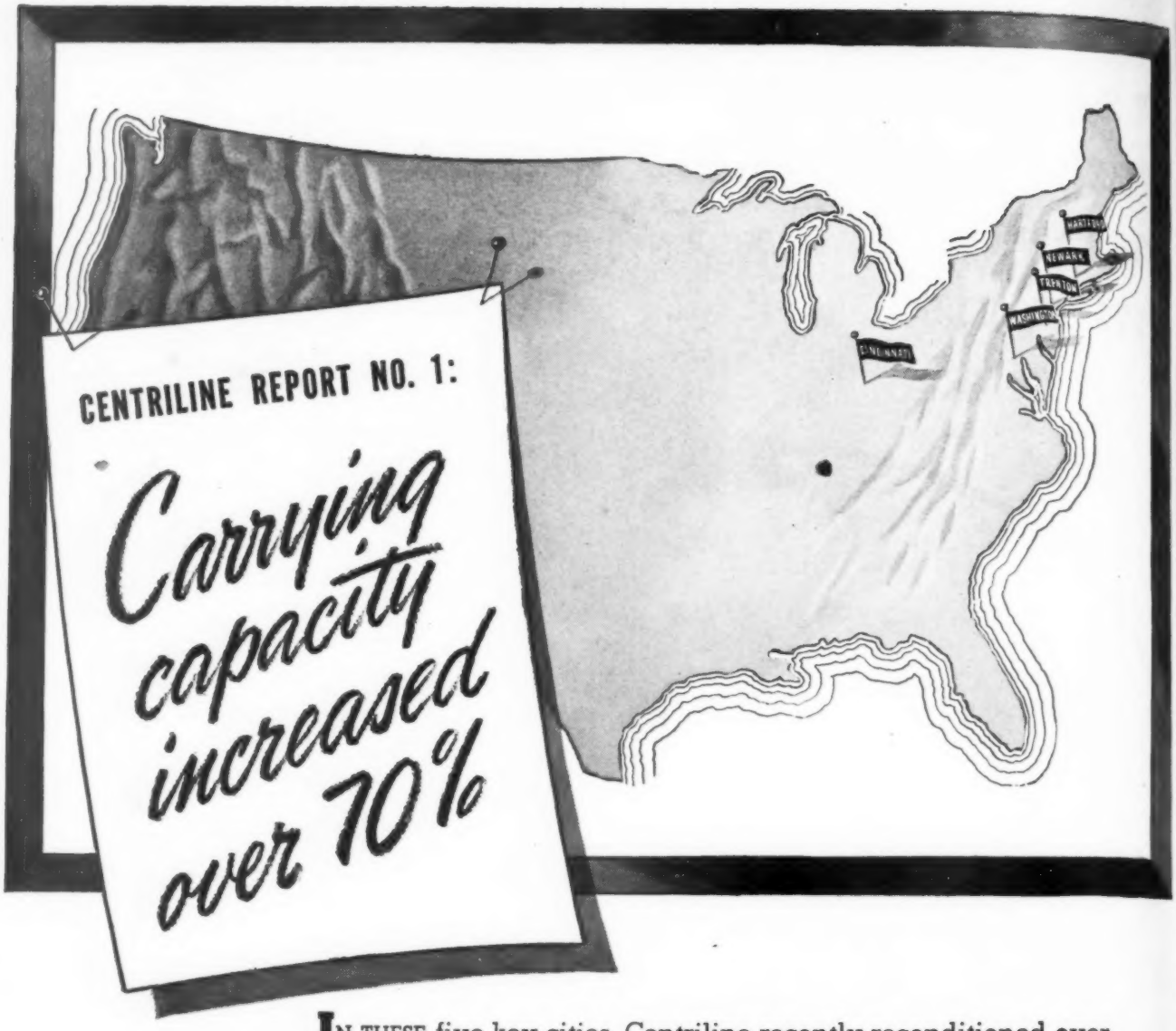
CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

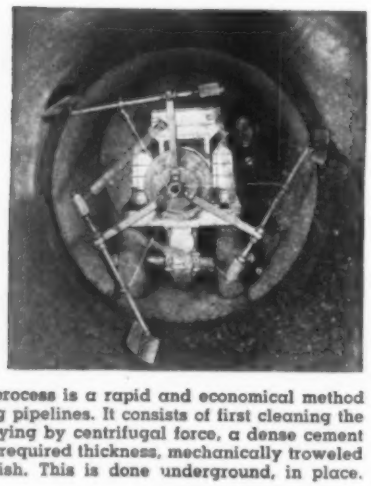
Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.



IN THESE five key cities, Centriline recently reconditioned over a hundred thousand feet of important water supply mains . . . with the result of an average increase of over 70% carrying capacity.

These pipelines . . . ranging in sizes from 36" to 48" and varying in ages from 25 to 51 years . . . were badly crippled and choked because tuberculation and corrosion had taken a strong hold of their hydraulic efficiency. However, Centriline men and equipment went to work and soon had them in smooth-running condition.



The Centriline process is a rapid and economical method of reconditioning pipelines. It consists of first cleaning the main, then applying by centrifugal force, a dense cement mortar lining of required thickness, mechanically troweled to a smooth finish. This is done underground, in place.

Don't wait for tests to show a decrease in carrying capacity and your budget to go off balance with costly pumping expenditures—CENTRILINE NOW! Wherever your pipeline is situated, whatever its length—if its diameter is 30" or more—our men can quickly reach and recondition it. We welcome your inquiry.

CENTRILINE PROCESS

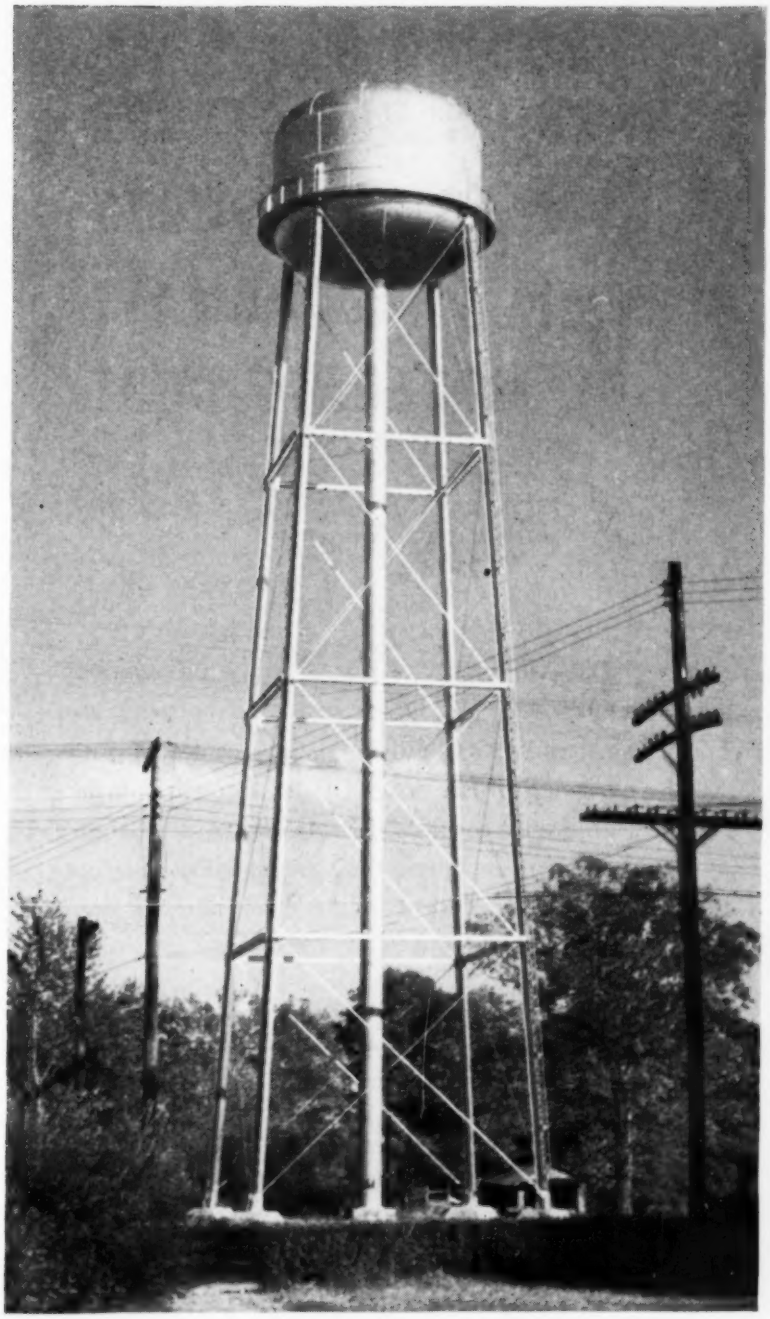
CENTRILINE CORPORATION

148 CEDAR STREET • NEW YORK 6, N. Y.

Restores and Protects Pipe-Line Carrying Capacity

MARION, ALABAMA GIVES

Water Distribution A "BOOST"



A new deep well and turbine pump and a recently-installed 100,000-gal. Horton elevated storage tank (shown above) enabled the city of Marion, Alabama, to give water pressure a "boost." A 325,000-gal reservoir and the new tank serve 2,300 inhabitants, who are located within an area of 3.25 sq. mi.

Marion, Alabama's, daily water consumption of 85,000 gals. is distributed through approximately 8 miles of 2, 4, 6, and 8 in. mains. Water pressure at the pumping plant, which is located at the well-site, is 65 lbs. per sq. in. A check-up after the elevated tank was installed showed pressure throughout the distribution system to be uniform. Power costs for driving the pumps (based on 2,300 population) averages two tenths of one cent per day per person!

If your city is planning changes in its water distribution system, has a problem of water pressure fluctuation or requires a reserve of water for fire protection, better check the possibilities of Horton elevated storage first. A letter addressed to any of our offices stating capacity required, height-to-bottom and possible erection site will bring you estimated cost of installing a Horton elevated tank.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th Street

Plants in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Washington 4.....703 Atlantic Bldg.
San Francisco 11.....1283-22 Battery St. Bldg.

In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

HIGH STRENGTH
CORROSION RESISTANCE
WORKABILITY
WELDABILITY
MODERATE COST

get them all in Everdur Metal

SINCE 1927, the use of Everdur* Copper-Silicon Alloy for sewage treatment and water works equipment has continually expanded. Possessing tensile strength comparable with mild steel, and corrosion resistance equal to or better than copper, Everdur permits light-weight construction without sacrifice of durability.

This enduring, economical alloy is readily machined, welded and fabricated into almost any type of equipment you may need, and is available in practically all commercial forms.

Check off the items of equipment in your plant where corrosion troubles suggest replacement with Everdur. For detailed information, write for Publication E-11, "Everdur Metal for Sewage Treatment Equipment, Reservoir and Water Works Service." 45N1

*Reg. U. S. Pat. Off.

Keep Faith With Your Fighters and Yourself!

BUY WAR BONDS FOR KEEPS

SEWAGE TREATMENT AND WATER WORKS EQUIPMENT

- Anchors
- Baskets
- Bolts
- Built-up Sluice Gates
- Coarse Bar Rack Aprons
- Coarse and Fine Screens
- Effluent Weirs and Scum Weirs
- Electrical Conduit
- Flashboard Supports
- Float Chambers
- Float Gage Chains
- Flush Box Fittings
- Guides
- Ladders
- Manhole Steps
- Orifices
- Pipe
- Screen Frames
- Screen Hoppers
- Spillway Fittings
- Steps
- Structural Scum Baffle Brackets
- Swing Gates
- Troughs
- Valve Springs
- Valve Stems
- Walkways

ANACONDA
From mine to consumer

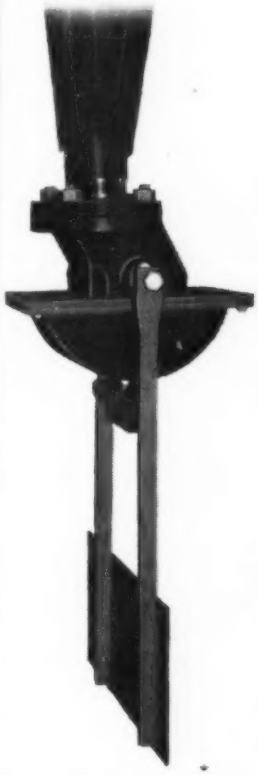
Everdur Copper-Silicon Alloy

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Ol' Man River GETS REPORTED

BUILDERS Chronoflo* Telemeter

UNIQUE APPLICATION MEASURES AND RECORDS RIVER'S FLOW



Velocity Vane swings off vertical in direction of flow.

Chicago had a problem in a Lake Michigan intake crib . . . polluted river water, driven by the wind, at times flowed towards the intake and necessitated increased chemical treatment. Builders engineers solved the problem with a unique device which records changes in river flow direction, and reports flow conditions to the distant pumping station. This "Chronoflo Direction and Velocity Vane", calibrated at a leading university, is installed on a bridge in the river. A Builders Chronoflo Transmitter, cable-connected to the vane, transmits signals to the Chronoflo Receiver in the pumping station, thereby providing an accurate chart record of river flow and assuring correct chemical treatment. Once again, the versatility of the Builders Chronoflo Telemeter is dramatically demonstrated.

For further information on the Chronoflo Telemeter ask for Bulletin 320A. Address Builders-Providence, Inc., (Division of Builders Iron Foundry), 10 Codding St., Providence 1, R. I.

*Trade-Mark Reg'd

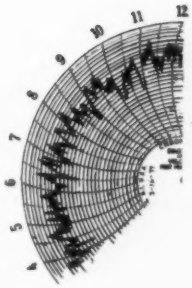


Chart showing flow out of lake. Wind very gusty and strong.

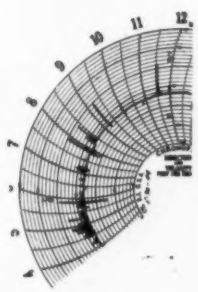


Chart showing flow into lake. Radial lines indicate boats passing.

Sincerely

BUILDERS - PROVIDENCE

Cast iron pipe foundries, having broken all pipe production records for war requirements, are now also producing pipe for civilian needs. These foundries, with increased facilities, are all set for V-J Day and the vast tonnage of cast iron pipe which will shortly thereafter be required by war-deferred water works construction. Meanwhile, pipe is obtainable in growing volume without detriment to war orders and is becoming increasingly available, month by month. Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3, Illinois.

CAST IRON

CAST IRON PIPE

SERVES FOR CENTURIES

Palatability is Protected ...ON EVERY FRONT

In each of our war theaters American water engineers travel with front line troops to assure adequate water supplies for our fighting men. These men must guard against contamination, provide palatable drinking water and at the same time defend their equipment against enemy attack.

Here in America it is not necessary for water works officials to protect their raw water supplies with a shot gun, but it is essential to guard against contamination that affects the palatability of their water.

Aqua Nuchar, at home or abroad, is ***the*** method of purification, because it works on the ***ad***sorptive principle—trapping algae and other aqueous impurities in the many faceted surface of each microscopic particle of carbon.

At strategic points throughout the United States you'll find stocks of Aqua Nuchar—the activated carbon that does the big job of purification. . . by ***ad***sorption.

BLUEPRINT NOW

But above all, remember there is a war yet to be won. Maintain equipment to assure operation at 100% efficiency.

INSURES PALATABLE DRINKING WATER
NUCHAR

INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP AND PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. · 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS · 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. · 844 LEADER BLDG., CLEVELAND 14, OHIO

Behind the products of this Company is over forty years of engineering experience covering designs for installations in all fields of pressure pipe service. With this experience are coupled the resources of our modern research laboratory for the development of new and improved practice in the production and utilization of cast iron pipe and fittings. If you have a pipe design problem, feel free to draw on the experience and "know how" of our technical staff, without obligation.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

Lithographed on stone by Edward A. W...

Source of "Firsts"

Modern Research Laboratory at Niagara Plant as interpreted by the artist, John Gaydos

THE FACT that Niagara was the first to produce several important electro-chemical products in this country is due in great part to the efficiency of its research. Niagara's research activities are under the supervision of men of long and thorough experience in electro-chemical development, manufacture, and usage. This has enabled Niagara to give valuable cooperation to many industries using such products in the processing of war materials. It will prove of equal value in helping these industries convert efficiently to peacetime manufacture. Look to Niagara for experienced chemical service.

Niagara ALKALI COMPANY

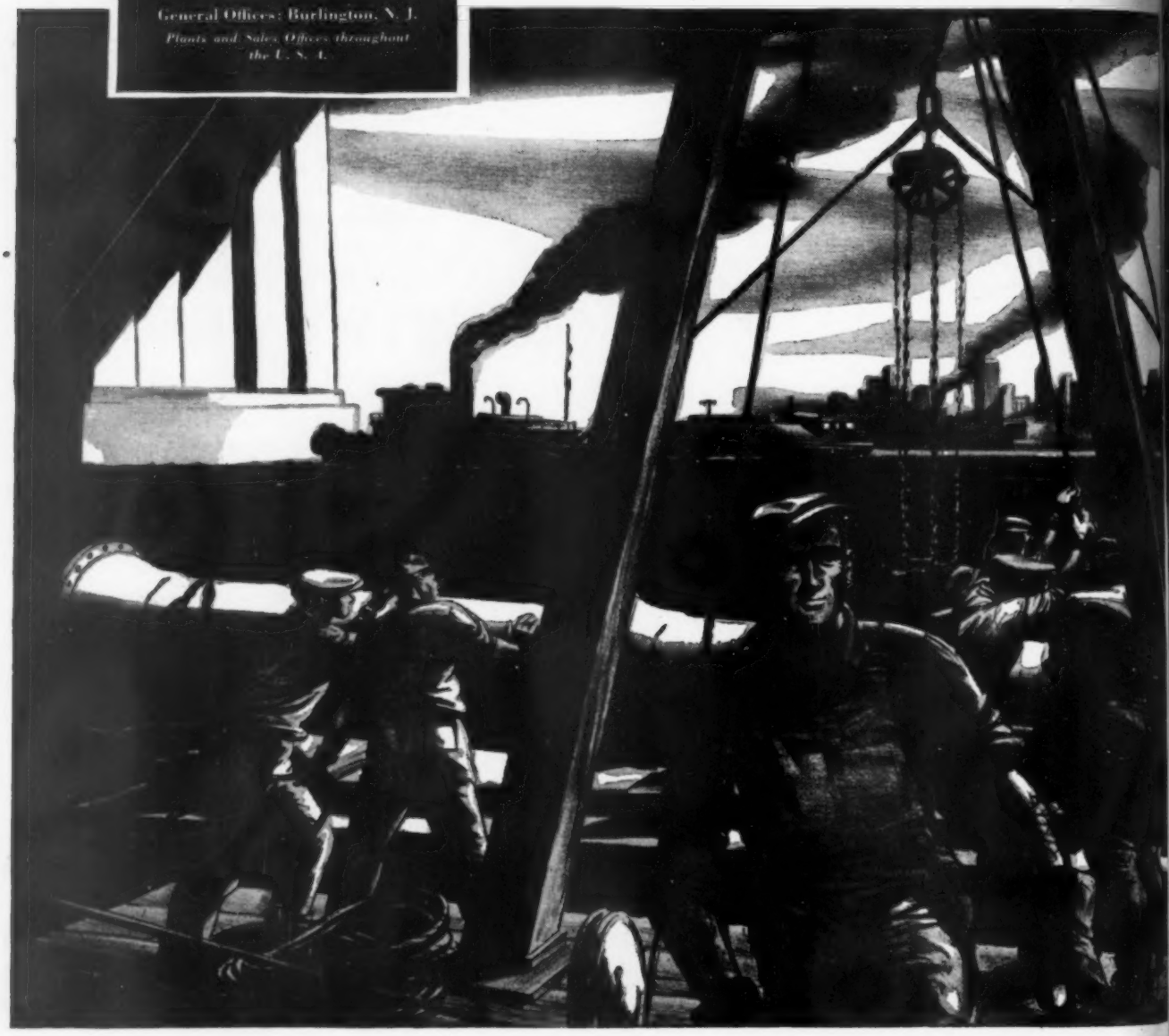
60 EAST 42nd STREET, NEW YORK 17, N. Y.

Behind the products of this Company is over forty years of engineering experience covering designs for installations in all fields of pressure pipe service. With this experience are coupled the resources of our modern research laboratory for the development of new and improved practice in the production and utilization of cast iron pipe and fittings. If you have a pipe design problem, feel free to draw on the experience and "know how" of our technical staff, without obligation.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

Lithographed on stone by Edward A. Wil



Source of "Firsts"

Modern Research Laboratory at Niagara Plant as interpreted by the artist, John Gaydos

THE FACT that Niagara was the first to produce several important electro-chemical products in this country is due in great part to the efficiency of its research. Niagara's research activities are under the supervision of men of long and thorough experience in electro-chemical development, manufacture, and usage. This has enabled Niagara to give valuable cooperation to many industries using such products in the processing of war materials. It will prove of equal value in helping these industries convert efficiently to peacetime manufacture. Look to Niagara for experienced chemical service.

Niagara ALKALI COMPANY

60 EAST 42nd STREET, NEW YORK 17, N. Y.

Because it is so important for weir plates to retain profile and section, this application can easily become a real maintenance headache unless a durable material is used. Wrought Iron has made a real name for itself in this service, and is being applied in increasing quantities by engineers who seek to avoid premature replacements.

The illustration shows wrought iron weirs in a primary settling tank in an Illinois disposal installation. A number of the most modern plants built in recent years, in Minnesota, Iowa, Texas, and Washington, D.C., have wrought iron weirs of various types to control and distribute flow to or from grit chambers, settling basins, or plenum chambers.

Wrought iron's superior durability in this corrosive service is the direct result of its unique, two-component composition. The tiny fibers of glass-like silicate slag that are threaded through the body of high-purity iron act like a series of staggered baffles, to halt and disperse corrosive attack. This discourages the local pitting and rapid penetration that generally cause ordinary materials to fail. In addition, these fibers anchor the initial protective scale, that shields the underlying metal. In cases where galvanizing is used, the microscopically rougher surface of wrought iron takes and retains a heavier coating. It is important to remember, however, that wrought iron does not rely on surface coatings for its long life.

Another advantage of particular interest at this time is the favorable delivery situation. All the heavy demands of the military forces have been and are being filled promptly. At the same time, the requirements of the sanitary field can be handled promptly.

You will find some illustrations and descriptions of a few of the many weir plate installations in our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations." We will be very glad to send you a complimentary copy.

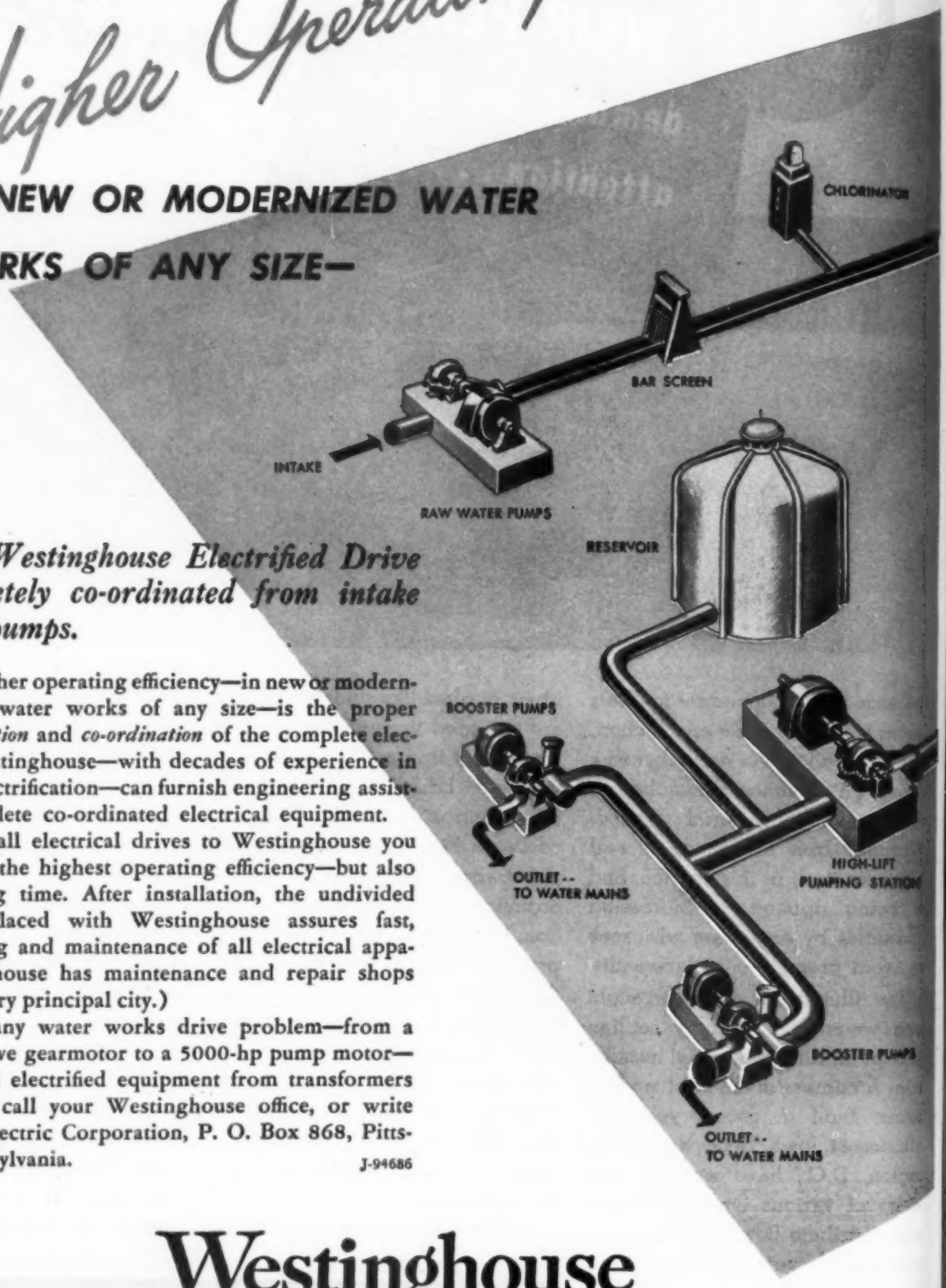
A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

PLAN FOR

Higher Operating Efficiency

IN NEW OR MODERNIZED WATER WORKS OF ANY SIZE—



. . . with Westinghouse Electrified Drive . . . completely co-ordinated from intake to booster pumps.

The key to higher operating efficiency—in new or modernized electrified water works of any size—is the proper *selection, application* and *co-ordination* of the complete electrical drive. Westinghouse—with decades of experience in water works electrification—can furnish engineering assistance, *plus* complete co-ordinated electrical equipment.

By assigning all electrical drives to Westinghouse you not only assure the highest operating efficiency—but also save engineering time. After installation, the undivided responsibility placed with Westinghouse assures fast, efficient servicing and maintenance of all electrical apparatus. (Westinghouse has maintenance and repair shops in practically every principal city.)

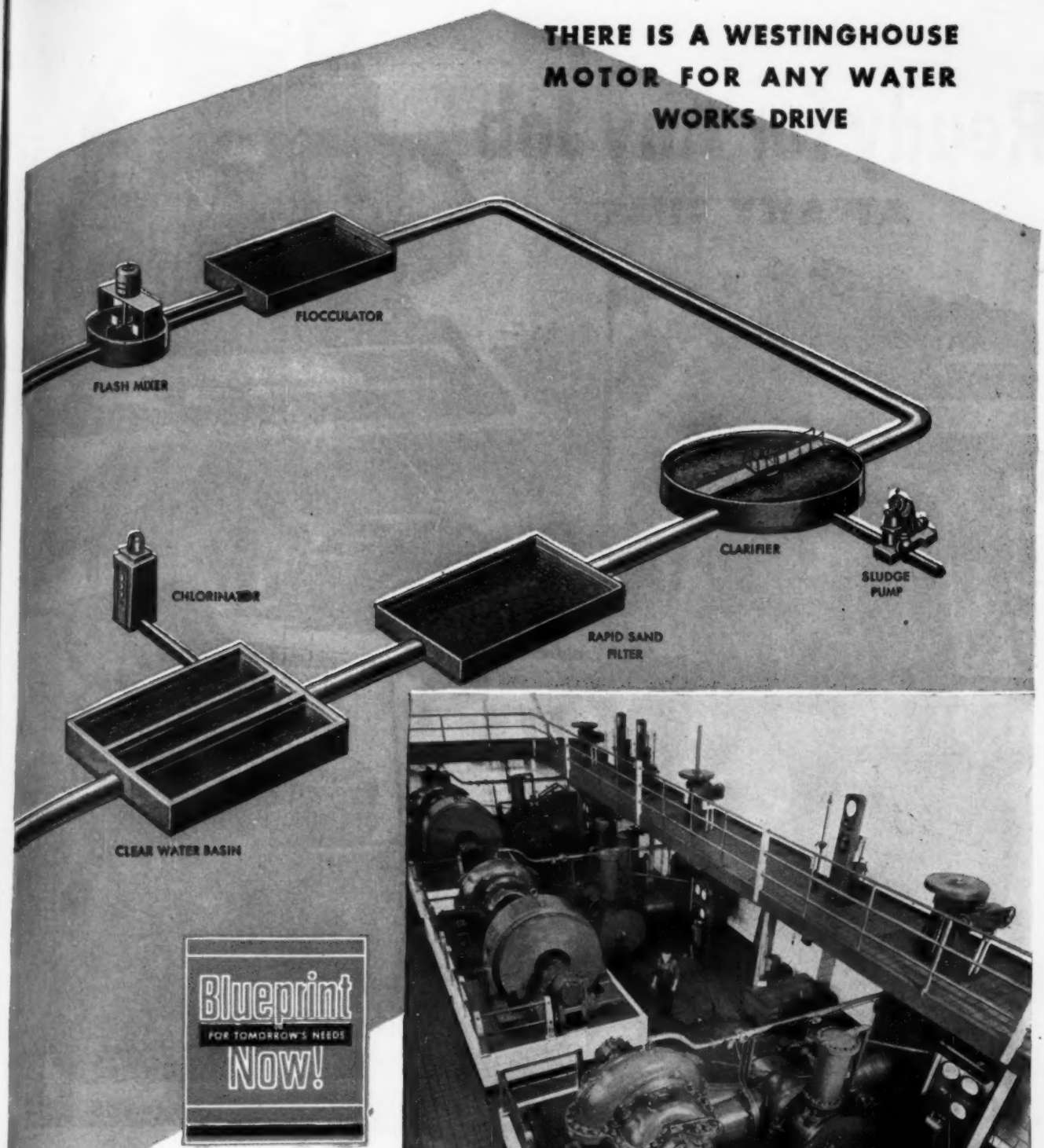
For help on any water works drive problem—from a 1-hp clarifier drive gearmotor to a 5000-hp pump motor—or on associated electrified equipment from transformers to pushbuttons, call your Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94686

Westinghouse

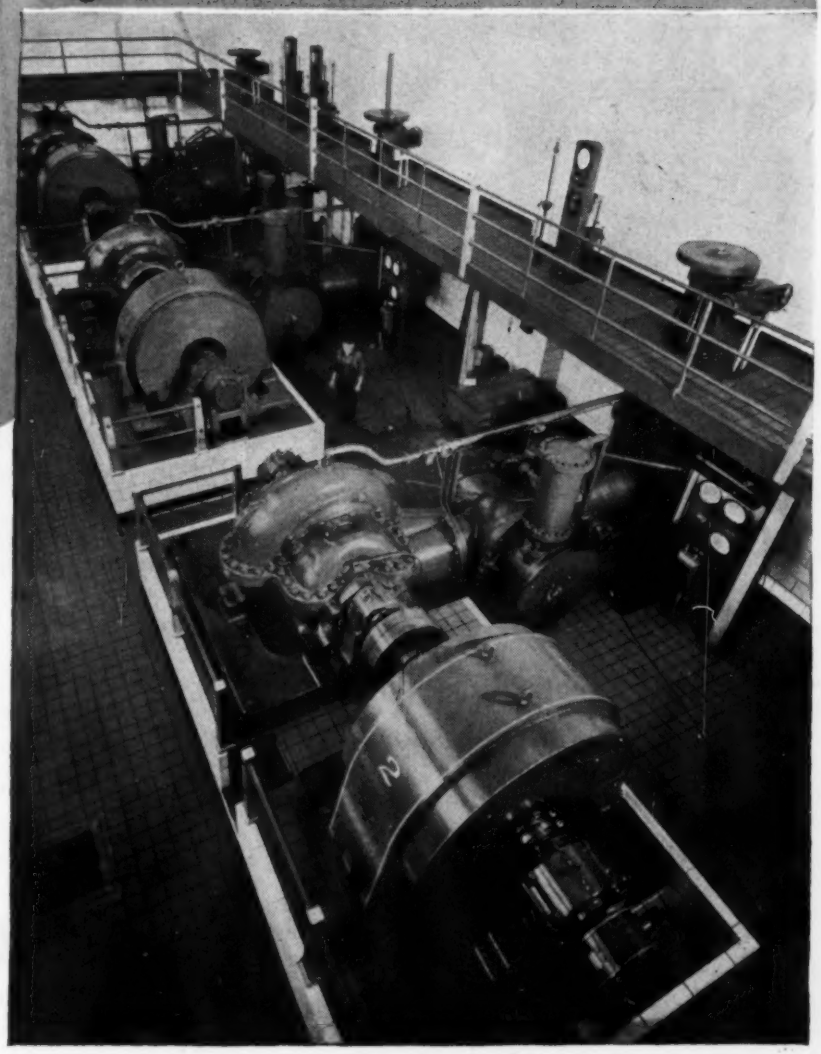
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Complete Electrical Equipment for Water Works

THERE IS A WESTINGHOUSE MOTOR FOR ANY WATER WORKS DRIVE



Blueprint FOR TOMORROW'S NEEDS Now!



Water pumps at the Cermak Pumping Station, Chicago Water System, are driven by these 1500-hp, 514-rpm Westinghouse synchronous motors.

WESTINGHOUSE

Ready for Any Job

AT ANY TIME

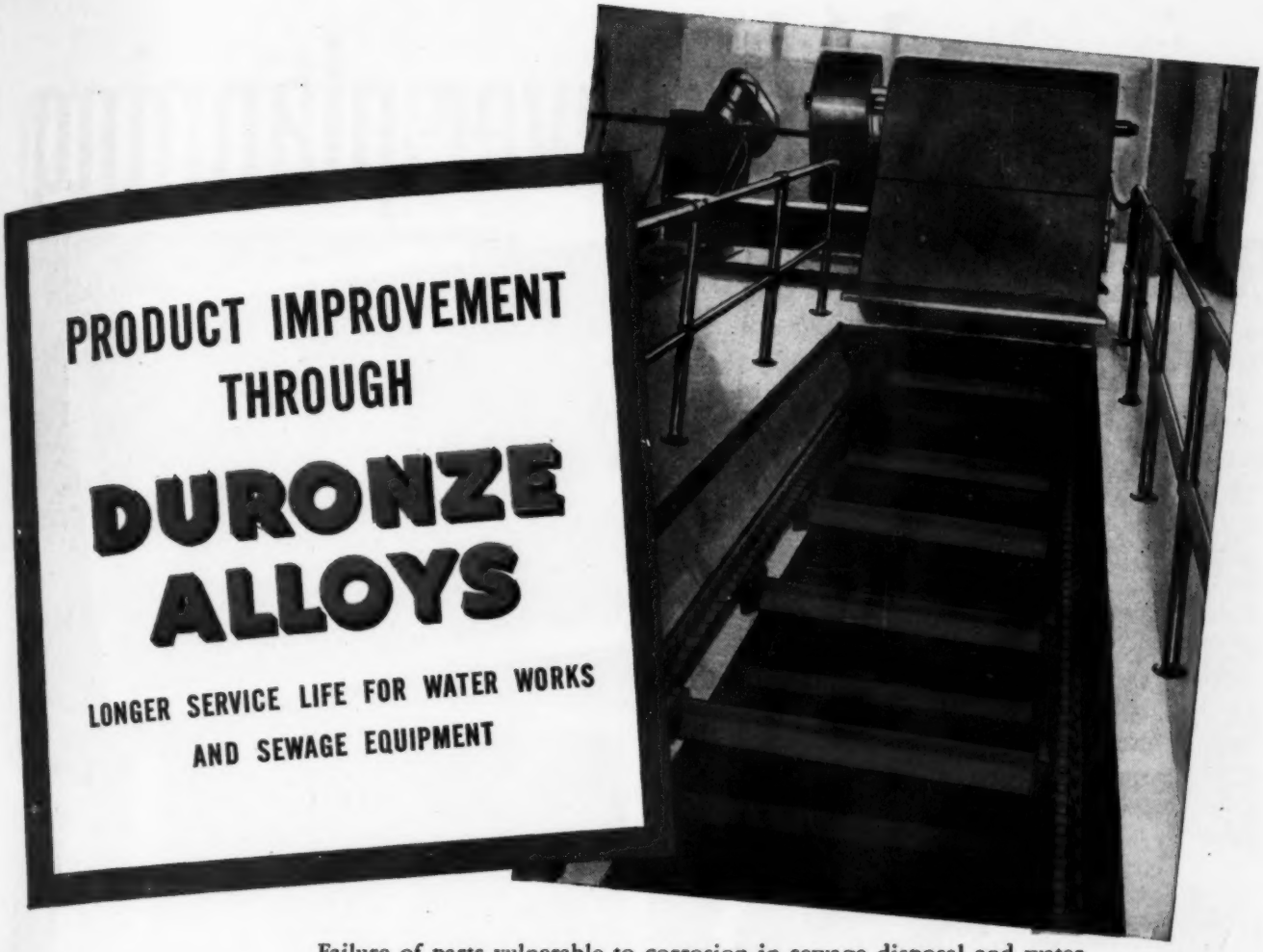
Here's another way that you can use a portable Homelite Gasoline-Engine-Driven Generator. Simply hook up a power wrench to a Homelite and you'll open and close gate valves, quicker and easier than ever before.

Homelite Portable Gasoline-Engine-Driven Generators are "ready for any job at any time" because they are dependable at all times... ready to start and sure to run without trouble, no matter where you put them or what the working or weather conditions are.

Homelite Corporation

Portable PUMPS • GENERATORS • BLOWERS

PORT CHESTER, NEW YORK



PRODUCT IMPROVEMENT THROUGH

DURONZE ALLOYS

LONGER SERVICE LIFE FOR WATER WORKS AND SEWAGE EQUIPMENT

Failure of parts vulnerable to corrosion in sewage disposal and water supply equipment can impair the efficiency of an entire system. Yet in most cases the cost of *prevention* is only a small fraction of the cost of repair or replacement.

Duronze III (silicon aluminum bronze) withstands many corrosive conditions encountered in sewage treatment, such as recovery of gases and fats; sludge digestion involving liberation of carbon dioxide, methane and other gases; and filtration involving acid solutions.

Duronze III has a tensile strength of approximately 85,000 psi as annealed rod, and approximately 90,000 psi as a hot forging. It hot forges readily and machines from 50% to 75% as fast as free-cutting brass. Duronze III also has a low coefficient of friction when in slow-moving contact with most other materials, and therefore, resists mechanical abrasion and wear.

Duronze alloys can bring extra-long service life to such parts as frames, gates, racks, sludge and scum scrapers, aprons, distributors, weirs, screens and grit collectors, as well as pump parts, valve stems, guides, bushings and other components. Other applications are corrosion resistant tubing, high strength nuts and bolts for water meters and for fastening screens and general structural uses.

Contact the nearest Bridgeport Office and write for Bridgeport's 80-page Duronze Manual containing the latest specifications and data on five outstanding engineering alloys together with suggested applications.

BRASS • COPPER
BRONZE • DURONZE
Strip • Rod
Wire • Tubing

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • *Established 1865*

Duronze Alloys—PRODUCTS OF

BRIDGEPORT BRASS

Wherever planning

JOHNS-MANVILLE

JM PRODUCTS

Johns-Manville

committees meet...

The *swing* is to TRANSITE PIPE

for efficient, economical Water Transportation

FOR the same good reason that Transite Pipe has been chosen for service in thousands of American communities in the past... this asbestos-cement pipe is now getting the call on many of the water-works projects planned for tomorrow.

That reason is: efficient, economical water transportation—proved through the years.

If you are planning an improvement program for the days ahead, it will pay you to look into these money-saving advantages of Transite Pipe:

High Flow Capacity. Because Transite is non-metallic, tuberculating waters can never reduce its initial high flow rate (C=140). This often permits use of smaller diameter pipe . . . and ends problems arising from progressive reduction of carrying capacity due to tuberculation.

High Corrosion Resistance. And that means outside, inside and all the way through . . . proved by installations in virtually all types of soils, under a wide range of service conditions.

Low Installation Costs. Light in weight, Transite Pipe requires fewer men for handling, smaller installation crews. Mechanical handling equipment is not needed except for the larger sizes.

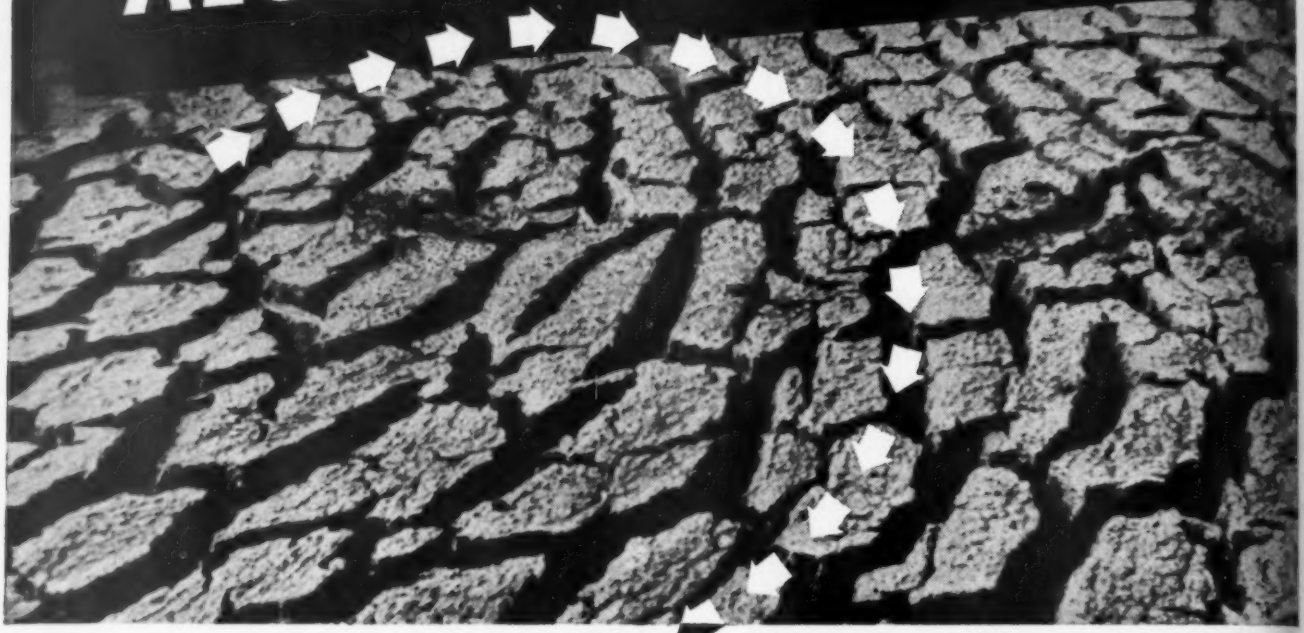
Rapid Assembly. The Simplex Coupling provides tight, flexible joints . . . permits quick, easy assembly even with inexperienced crews. And, joints stay tight even when the line is deflected as much as 5° at each coupling.

* * *

For detailed information about these and other advantages of Transite Pipe as a water carrier, send for illustrated brochure TR-11A. Address Johns-Manville, 22 E. 40th St., New York 16, N.Y.

Asbestos TRANSITE PIPE

GENERAL CHEMICAL ALUMINUM SULFATE



Well cracked sludge bed shortly after Aluminum Sulfate treatment.

SPEEDS SLUDGE DRYING

General Chemical Alum speeds sludge dewatering and drying on sand beds... capacity of beds may be doubled, even tripled . . . quick removal lessens chance of odor and fly nuisance . . . reduced volume of cake decreases cost of removal. Sewage works operators the nation over count on the benefits obtained from Alum treatment throughout the year.

Why not learn what General Chemical Alum will do in your plant too? Full information may be obtained quickly from the nearest General Chemical Sales and Technical Service Office listed below.

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh Providence (R. I.) • San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee & Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

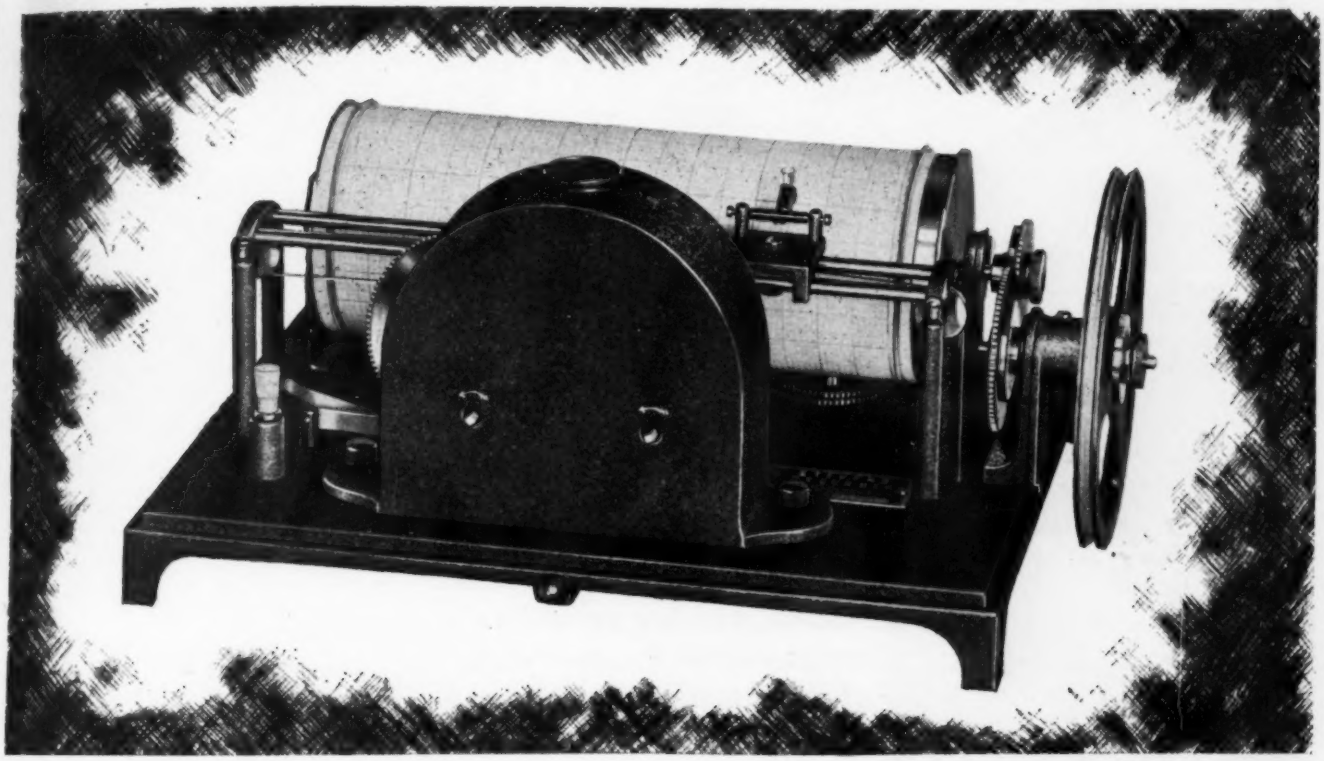
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

STEVENS WATER LEVEL RECORDER *Type F*

Portable, inexpensive, popular.

Also sensitive, simple and reliable. What more could an engineer ask in a depth recorder for water or sewerage?

The Stevens *Type F* Recorder is a veteran in our line and is in constantly increasing demand. It is an inexpensive general utility recorder for daily or weekly service, unlimited in range. *Type F* is particularly suited for securing ground water levels in deep wells; for stream gaging, irrigation, domestic water supplies, sewerage; and for use with weirs, Parshall flumes, Venturi tubes, or any other type of measuring device in which heights, or the differences in heights, are an index of flow.



Type F has a removable chart drum; 8-day clock with abundant power; charts — both English and metric are available . . . Maybe this simple recorder is just what you need. Ask for Bulletin No. 24 — and judge for yourself.

LEUPOLD & STEVENS INSTRUMENTS

MANUFACTURERS SINCE 1907

PORTLAND 13, OREGON

Hydrographic, Surveying, Navigation, Automatic Controls

L&S

Leupold & Stevens Instruments
4445 N. E. Glisan St., Portland 13, Oregon
Please send Bulletin No. 24 on the Stevens *Type F* Recorder.

Name _____

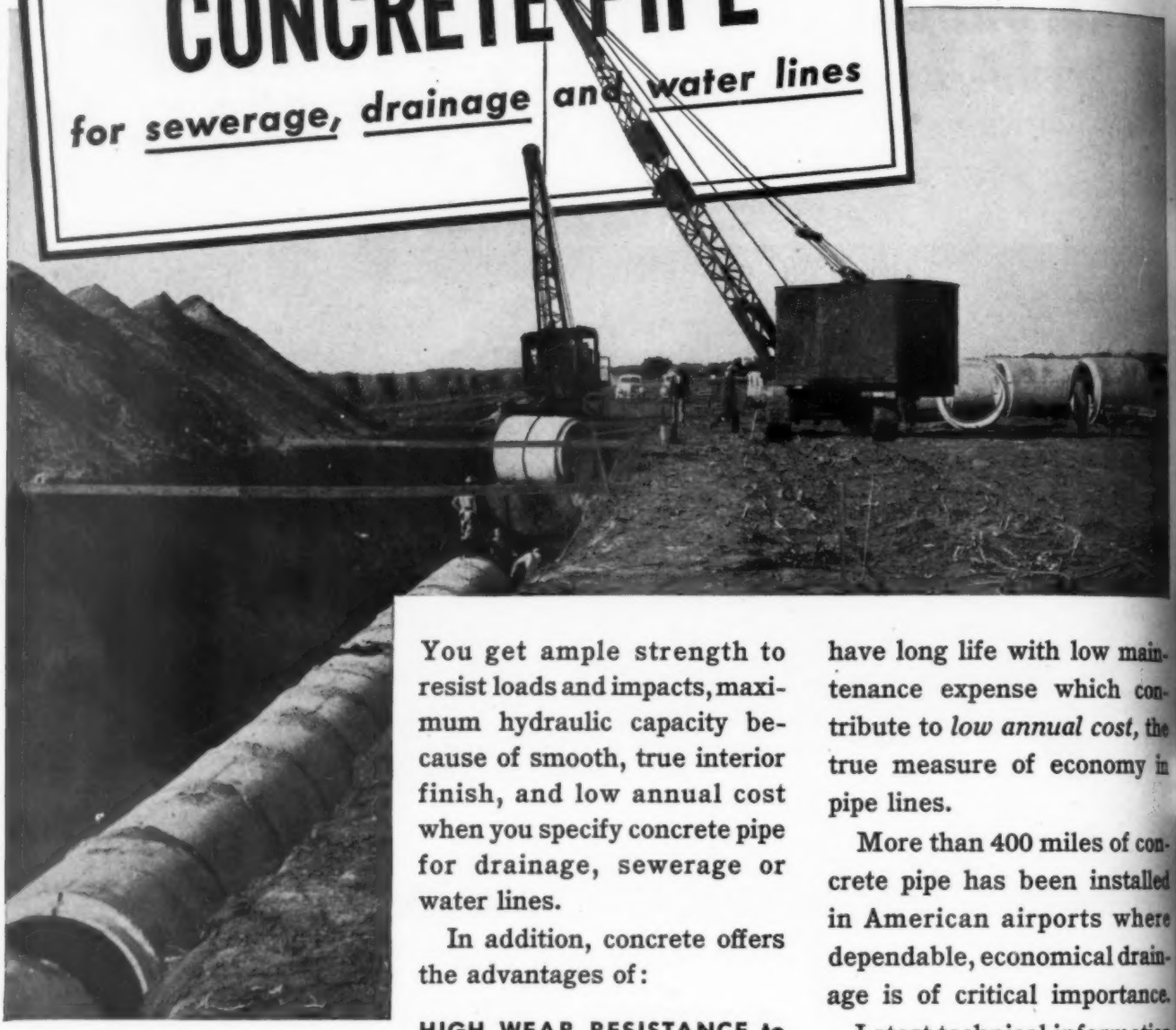
Organization _____

Title _____

Street _____

City _____ *Zone* _____ *State* _____

Get the advantages of CONCRETE PIPE for sewerage, drainage and water lines



Laying 4,500 ft. of 60-in. reinforced concrete pipe for outfall storm sewer at Municipal Airport, Waterloo, Iowa. Project involved total of 37,000 ft. of concrete pipe from 8-in. to 72-in. diameter. Drainage contractor, Gjellefald Construction Co., Forest City, Iowa. Prime contractor, Concrete Materials & Construction Co., Cedar Rapids.

You get ample strength to resist loads and impacts, maximum hydraulic capacity because of smooth, true interior finish, and low annual cost when you specify concrete pipe for drainage, sewerage or water lines.

In addition, concrete offers the advantages of:

HIGH WEAR RESISTANCE to abrasion by suspended grit.

MINIMUM INFILTRATION AND LEAKAGE assured by tight joints and uniformly dense concrete.

MODERATE FIRST COST—simple construction.

Concrete pipe installations have long life with low maintenance expense which contribute to *low annual cost,* the true measure of economy in pipe lines.

More than 400 miles of concrete pipe has been installed in American airports where dependable, economical drainage is of critical importance.

Latest technical information relating to selection, specifications and installation of concrete pipe lines is available to engineers and officials planning drainage, water supply or sewerage projects. Free in the United States and Canada.

BUY AND KEEP MORE WAR BONDS

PORTLAND CEMENT ASSOCIATION

Dept. A8-29, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

For

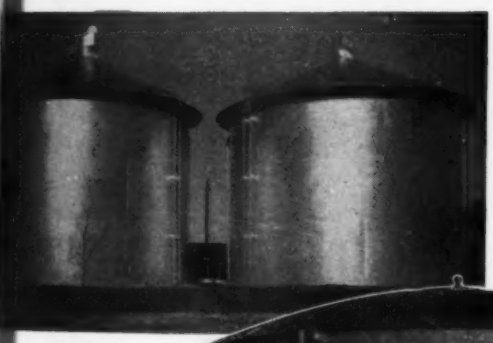
- LIFETIME PERMANENCE
- LOW FIRST COST
- LOW MAINTENANCE COST
- GUARANTEED SATISFACTION

Berryville, Va.—Two 3,000,000-gallon P·DM Steel Reservoirs

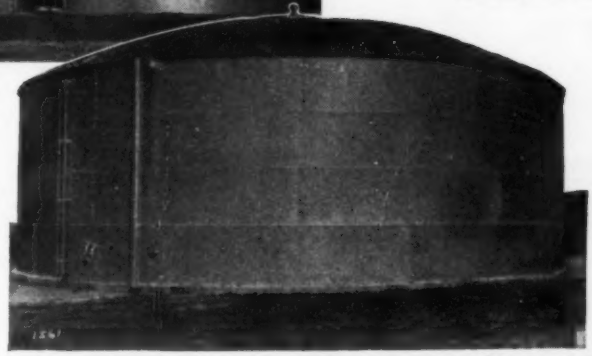
Specify Steel Reservoirs by PITTSBURGH · DES MOINES

In planning for water storage by reservoir, where supply and topographic conditions are favorable, be sure to combine the natural advantages and economies of this type of storage with the outstanding benefits of *steel* reservoir construction. Pittsburgh-Des Moines Steel Reservoirs are permanently strong and watertight—unaffected by weather or seasonal change—can be erected at any time of year—require only an infrequent coat of paint to retain new appearance, and are lower in first cost than other construction types. With a definite, responsible guarantee of satisfaction, P·DM Steel Reservoirs end your water storage problems upon installation—and *keep* them solved! *Write for descriptive Bulletin 102. Consultations gladly arranged on request.*

apitol Heights, Md.—1,500,000-gallon P DM Steel Reservoir



astic, Iowa—Two
,000-gallon P·DM
l Reservoirs



Bottineau, N. D.—
,000,000-gallon
·DM Steel Reservoir

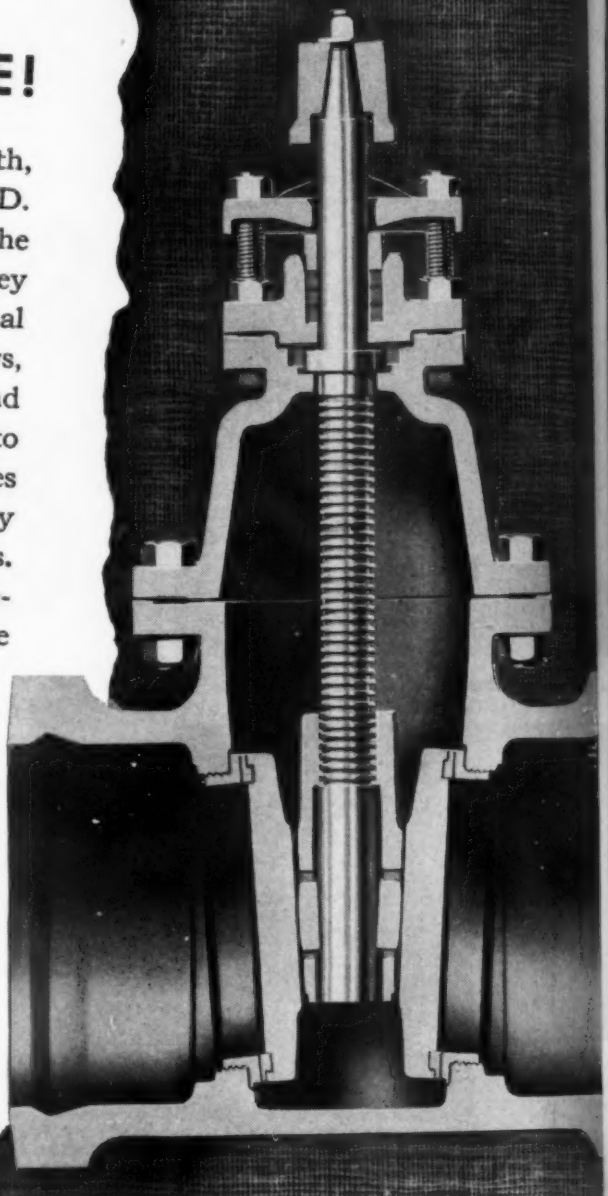
PITTSBURGH · DES MOINES STEEL CO.

PITTSBURGH, PA., 3412 NEVILLE ISLAND—DES MOINES, IOWA, 913 TUTTLE STREET
NEW YORK, ROOM 915, 270 BROADWAY · CHICAGO, 1216 FIRST NATIONAL BANK BUILDING
DALLAS, 1217 PRAETORIAN BUILDING · SAN FRANCISCO, 619 RIALTO BUILDING
SEATTLE, 900 FIRST AVENUE, SOUTH

ALL SET FOR LIFE!

Gate-valves, buried deep in the earth, are no problem when made by R. D. Wood. These smooth controllers of the water-flow are dependable workers. They have only three parts in the internal mechanism. No little rods, links, screws, or other parts to get out of order and jam the mechanism. No pockets to catch sediment or scale. And the valves are fully bronze-mounted to insure easy operation . . . for any number of years. R. D. Wood gate-valves meet all requirements of the A.W.W.A. and are tested to 300 pounds hydrostatic pressure. They are available in sizes from 2″ to 30″ and can be furnished either with bell-ends, flanged ends, spigot-ends, or other standard ends. For rugged strength; and simple, workable design, specify R. D. Wood gate-valves.

• BLUEPRINT NOW



R. D. WOOD COMPANY

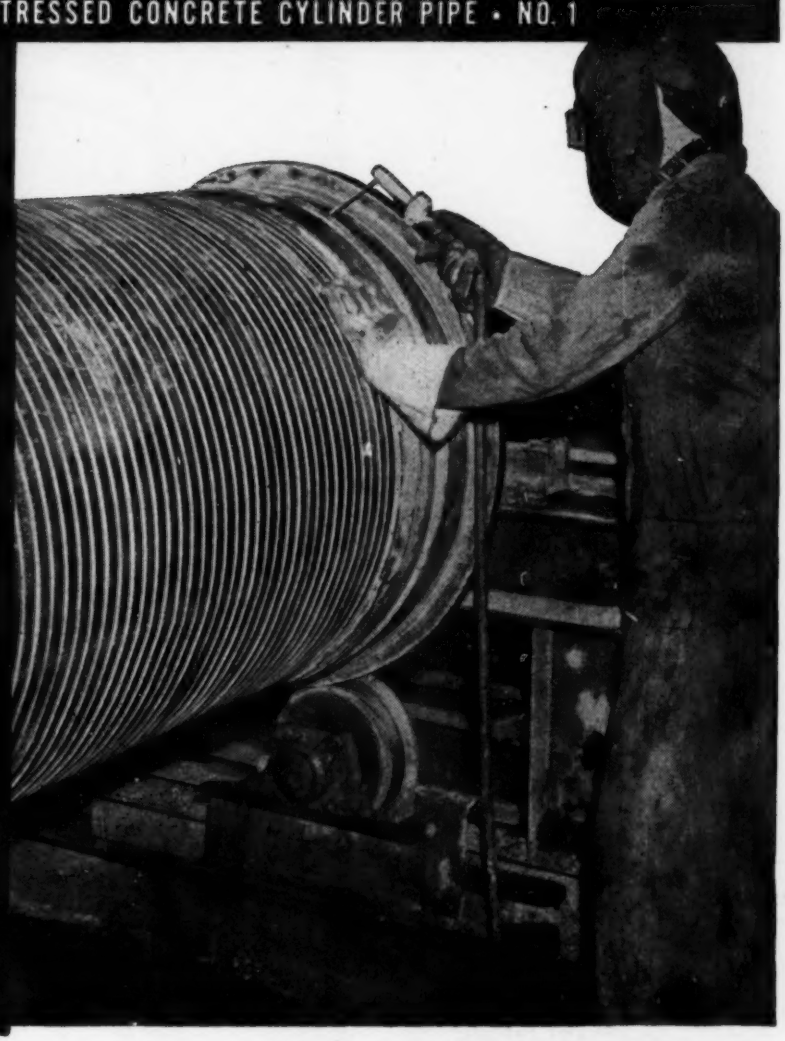
400 CHESTNUT STREET, PHILADELPHIA 5, PA.

Established in 1803

MANUFACTURERS OF MATHEWS HYDRANTS AND SANDSPUN PIPE
(CENTRIFUGALLY CAST IN SAND-MOLDS)

ADVANTAGES OF PRESTRESSED CONCRETE CYLINDER PIPE • NO. 1

Higher Pressure Ranges



PRESTRESSING, already well recognized as the normal trend of development in the design of reinforced concrete structures, is a "natural" for pressure pipes because of their tubular shape.

Lock Joint Pipe Company has applied the principles of prestressing steel in tension and concrete in compression in the design and manufacture of Lock Joint Prestressed Concrete Cylinder Pipe.

Retaining all the inherent advantages of the fundamental principles of Lock Joint pipe design, the use of high tensile steel makes possible still higher pressures in a greater range of sizes in keeping with Lock Joint economy of first cost and maintenance.

When you specify Prestressed Concrete Cylinder Pipe, you can depend upon a pipe of maximum elastic qualities as well as a pipe with the inherent benefits of water-tightness, durability and permanent high carrying capacity of steel cylinder design.

A Hazen-Williams Hydraulic Slide Rule will gladly be sent upon request with our compliments.

LOCK JOINT *Reinforced Concrete* PRESSURE PIPE

LOCK JOINT PIPE COMPANY

Established 1905

P. O. BOX 269, EAST ORANGE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill.
Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES { *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains of large diameter as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

A *cleaner* world than this one. Cleaner, more wholesome, more healthful.

A world with fewer diseases. A world in which people will live longer, healthier, more comfortable lives.

As an expert in the field of municipal sanitation, you are building that world today. Building it in the finest tradition of human progress—the progress that, in the past generation, has all but wiped out diseases like typhoid that once ran unchecked through entire communities.

That's why General Electric is particularly anxious to solicit your interest, suggestions, questions, criticisms—and, we hope, your complete *support*—of what we sincerely believe is the *next* great forward step in municipal sanitation.

That step is simply this: *the elimination of the "garbage can" in municipal life.*

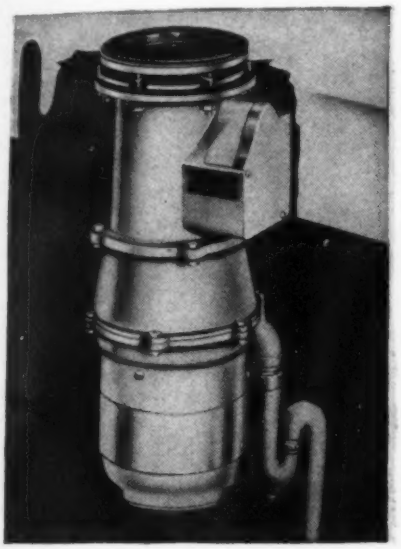
Just as the elimination of the outhouse has helped bring about higher standards of health, so, we believe, will *instantaneous water-borne disposal of food waste bring about still higher standards.*

QUESTIONS AND ANSWERS ABOUT THE *NEXT* ACHIEVEMENT IN SANITATION

1. What is this new step?

Broadly speaking, it is the *third* basic

What sort of world will your children live in?



development in the usage of sewerage systems. The *first* development, perfected by the Romans, was the use of sewerage systems for *drainage*. The *second*—less than a century old—was the utilization of drainage systems *for the disposal of human wastes*. The *third* step, we believe, is the use of sewers for the water carriage of properly processed food wastes, as well.

2. How can this be effected?

Through the G-E DISPOSALL—a kitchen appliance that converts fresh-food wastes into sewage . . . by shredding it and flushing it into the sewer system, in a form that mixes with sewage—and becomes a portion of it.

3. What's wrong with present garbage disposal systems?

The garbage can may seem logical, inevitable, unobjectionable. But so, once, did the outhouse.

The garbage can shares many of its evils. It keeps highly putrefactive organic material too near to where people live. As this material decays, it produces unwholesome odors—helps breed flies and feed dangerous rodents.

And now the fly is suspected of being one of the means of transmitting "polio" —the fly that may breed and feed in the garbage can.

4. What new problems will this step bring to your job?

None. Ten years of experimentation, and practical experience derived in over 300 communities, show that present day sewage-treatment systems will operate with either human wastes or fresh-food wastes, without distinction.

Past practice of having *two* distinct and *separate* systems for the disposal of basically similar materials is neither logical nor necessary.

5. But won't Disposall food wastes clog your system?

No. Conclusive data show that the light, fluffy character of the ground solids produced by the Disposall retains them in suspension without shoaling or settling.

Lines are not clogged or affected. Sewage-treatment plants function satisfactorily on either human wastes or fresh-food wastes shredded by the Disposall. Disposall-ground wastes settle, digest, and react generally exactly as your present sewage does. Sludge gas, too, can be utilized without change.

Ultimate universal use of the Disposall will require increased *capacity* in some of your plant facilities, but that's all.

6. Can you get more information?

Yes! The complete story of this coming step in sanitation, and the data showing why it will pose no new problems in your work, are available on request. We shall be glad, too, to answer any specific questions you may have about future installation of Disposalls in your city. Please write to Department WWS85, General Electric, Schenectady 5, N. Y.

Disposall

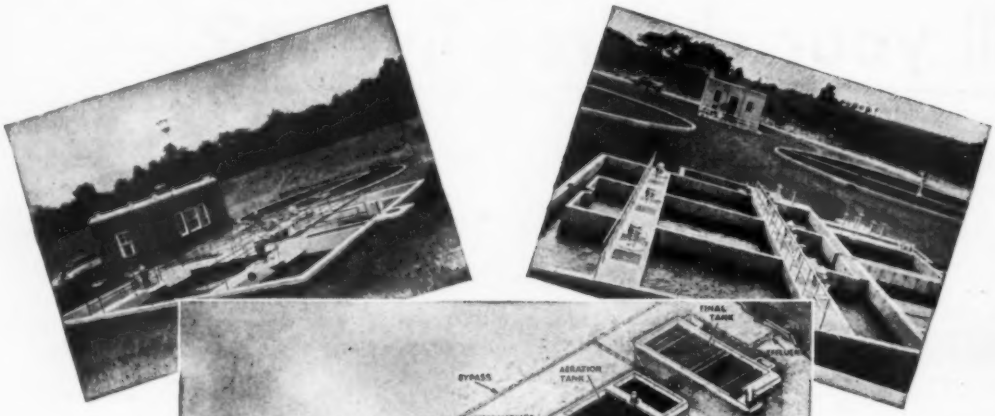
REG. U. S. PAT. OFF.

CONVERTS FOOD WASTE TO SEWAGE — ELIMINATES "GARBAGE"

GENERAL ELECTRIC

American Bio-Actuation

WASTE TREATMENT



COVINGTON
OHIO

CHILTON
WISCONSIN

FLOW SHEET

Bio-Activation combines the best qualities of both the trickling filter and the activated sludge process to produce a completely stable, nitrified effluent, low in B. O. D. and suspended solids.

TYPICAL OPERATING RESULTS

	Domestic, Malt, Brewery and Canning Wastes	
	5 BOD	Suspended Solids
Raw Waste	342	370
Primary Effluent	235*	134
Influent to Filter	510†	.....
Filter Effluent	99	143
Intermediate Effluent	58	65
% Reduction Filter Influent through Intermediate Effluent	89.5	.....
Final Effluent	13	15
% Overall Removal	97.5	96

*High Soluble 5 BOD from malt and brewery.
†Pea waste; 600-1200 ppm. 5 BOD, added in primary effluent.

Blue Print Now! — Send for Bulletin No. 259

THE AMERICAN WELL WORKS

Manufacturers of

PUMPING · SEWAGE TREATMENT · WATER PURIFICATION EQUIPMENT

RESEARCH · ENGINEERS · MANUFACTURERS · *Factory and Laboratories* · · · AURORA, ILLINOIS

Rust

Rust color in flowers is beautiful . . .

Rust holds no attraction when it appears on a hard-working pressure tank or pump. It is steel's worst enemy. Under the impetus of water and corrosive elements, it gnaws greedily unless routed by mechanical and chemical protectors.

NO-OX-ID is such a protector . . . forming a plastic coating which immediately checks underfilm corrosion. Once coated with NO-OX-ID, steel is *always* steel . . . never oxide of iron.

There is a grade of NO-OX-ID to combat every corrosive condition. The special grades engineered for water and sewerage plants give full protection under the severe conditions encountered. Consistencies are dense, yet flexible and of sufficiently high melting point to withstand the summer sun without flowing; tough enough to stand zero temperatures without cracking.

Time does not change NO-OX-ID. It is always the same at a given temperature—remains in perfect bond with the metal which it protects.

Use NO-OX-ID in your reconditioning program, or apply it to new equipment and property—tanks, pipes, valves, or steel structures.

In reconditioning, NO-OX-ID may be applied without extensive precleaning. It promptly penetrates to the parent metal—stops further corrosion and loss of metal.

Send for complete details about consistencies suitable for use in water and sewerage plants and data regarding methods of application.

Educational Film

Educational motion picture, in color, showing methods and equipment for applying NO-OX-ID, available to interested groups. Let us know the date you wish to show the film in your community.

Rust colored . . . one of the rare species of Chrysanthemums.

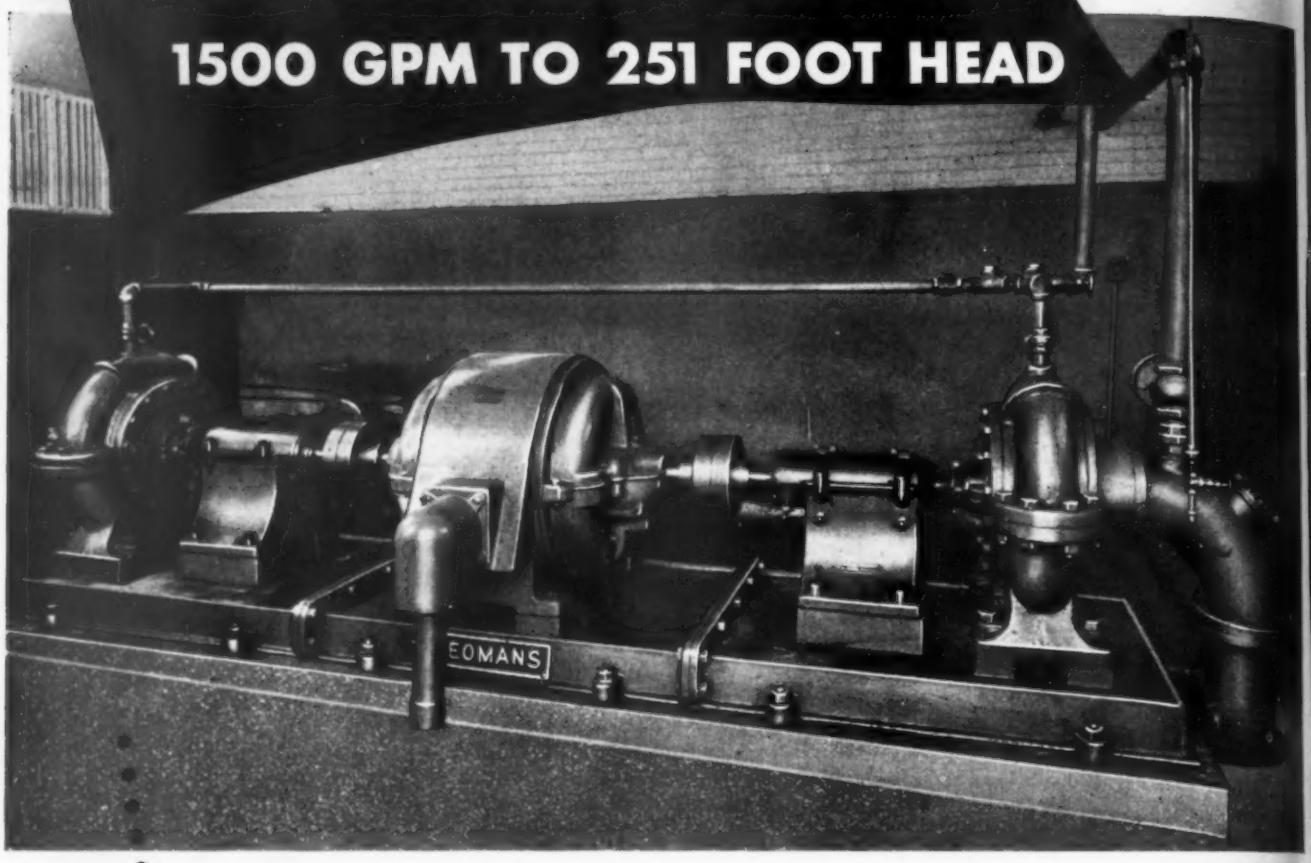
NO-OX-ID
IRON + OX = RUST
REG. TRADEMARK
AUG. 27, 1918

The ORIGINAL RUST PREVENTIVE

DEARBORN CHEMICAL
Dept. Y, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

How High Can Sewage Be Pumped?

THESE YEOMANS PUMPS LIFT 1500 GPM TO 251 FOOT HEAD



AN UNUSUAL ENGINEERING PROBLEM—the Mill Creek Drainage District of Ardmore, Pa., presented the problem of draining ordinary domestic sewage from a low lying area of 3940 acres and lifting 1500 GPM against a total dynamic head of 251 ft.

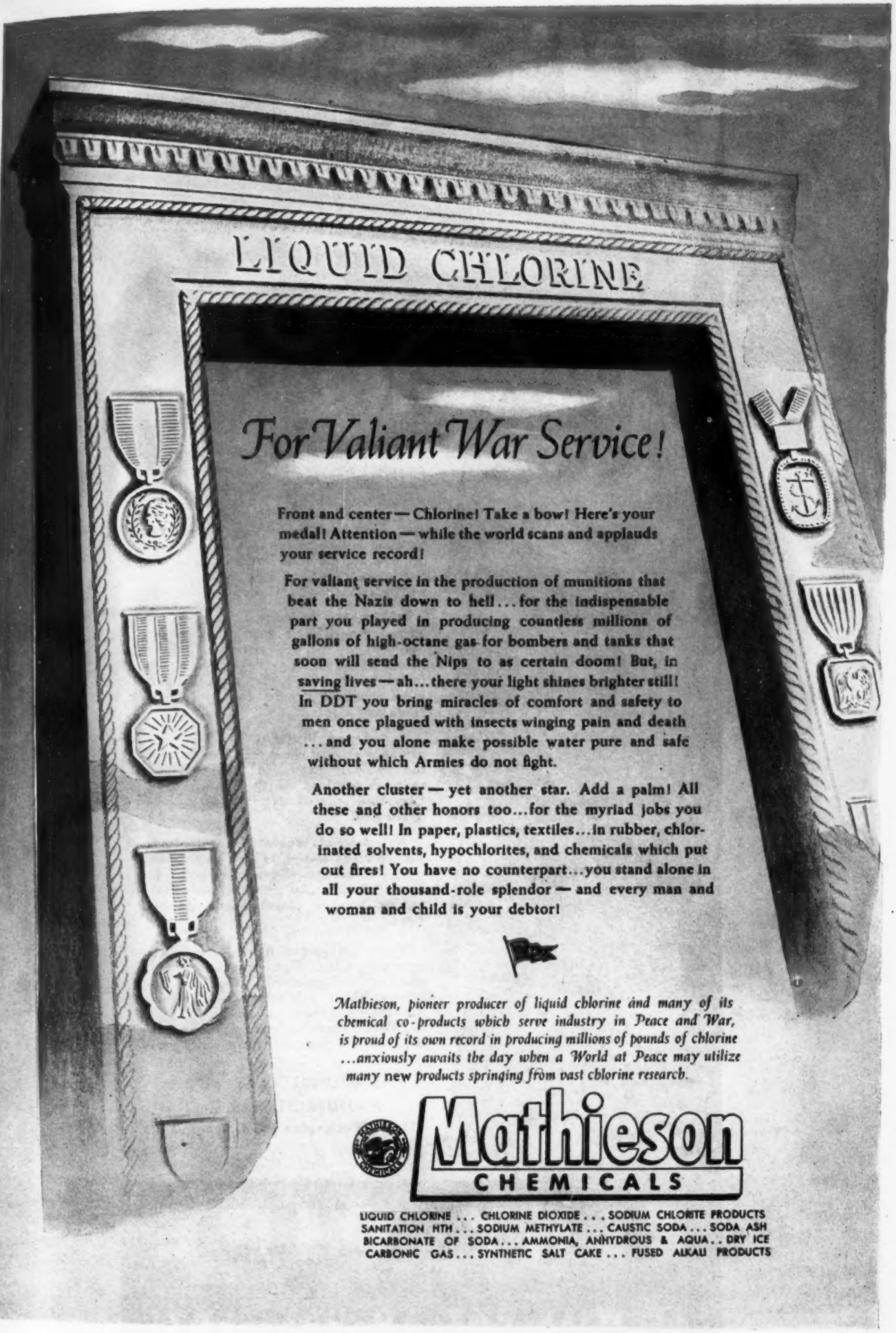
A SIMPLE, EFFECTIVE SOLUTION—two Yeomans centrifugal sewage pumps: horizontal, split-case non-clog units in series.

GOOD RESULTS—after thirteen years of tending quietly to business these well engineered, well built pumps are still functioning smoothly, effectively. Their series arrangement made it possible to use smaller motors of less aggregate horsepower—with lower initial cost, plus marked reduction of power consumption through the years.

Here indeed is proof of the economy and durable quality characteristic of Yeomans pumping installations. Well designed with high efficiencies, their performance justifies the faith placed in them.

Yeomans Brothers Company • 1423 North Dayton Street • Chicago 22, Illinois

Yeomans Brothers Company



For Valiant War Service!

Front and center — Chlorine! Take a bow! Here's your medal! Attention — while the world scans and applauds your service record!

For valiant service in the production of munitions that beat the Nazis down to hell... for the indispensable part you played in producing countless millions of gallons of high-octane gas for bombers and tanks that soon will send the Nips to as certain doom! But, in saving lives — ah... there your light shines brighter still! In DDT you bring miracles of comfort and safety to men once plagued with insects winging pain and death ... and you alone make possible water pure and safe without which Armies do not fight.

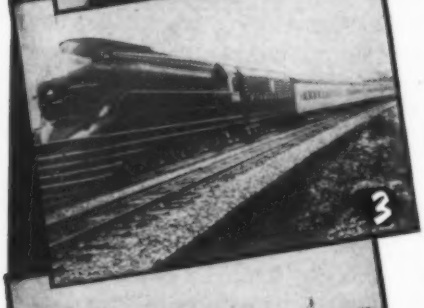
Another cluster — yet another star. Add a palm! All these and other honors too... for the myriad jobs you do so well! In paper, plastics, textiles... in rubber, chlorinated solvents, hypochlorites, and chemicals which put out fires! You have no counterpart... you stand alone in all your thousand-role splendor — and every man and woman and child is your debtor!

Mathieson, pioneer producer of liquid chlorine and many of its chemical co-products which serve industry in Peace and War, is proud of its own record in producing millions of pounds of chlorine ...anxiously awaits the day when a World at Peace may utilize many new products springing from vast chlorine research.

Mathieson
CHEMICALS

LIQUID CHLORINE . . . CHLORINE DIOXIDE . . . SODIUM CHLORITE PRODUCTS
SANITATION HTH . . . SODIUM METHYLATE . . . CAUSTIC SODA . . . SODA ASH
BICARBONATE OF SODA . . . AMMONIA, ANHYDROUS & AQUA . . DRY ICE
CARBONIC GAS . . . SYNTHETIC SALT CAKE . . . FUSED ALKALI PRODUCTS

CUT CRADLING AND CASEMENT COSTS WITH EXTRA-STRENGTH CLAY PIPE



Extra-Strength Clay Pipe is proving its superiority in actual installations in four main services for which it is specially designed.

1. **Road Building**—An up-and-coming Virginia county takes bids on all types of pipe for its road-building program. Extra-Strength Clay Pipe tops the list with *greatest strength at lowest cost.*

2. **Airport Drainage** — Selection of Extra-Strength Clay Pipe for all sub-drainage for the new airport of one of America's greatest cities assures the handling of today's heavy planes, provides against the heavy loads of tomorrow's sky giants.

3. **Railroad Drainage** — For ballast drainage on main-line trackage carrying the heaviest traffic, America's largest railroad employs 6-inch Extra-Strength Clay Pipe, placed *within a few inches of the rails.*

4. **Industrial Waste Disposal**—Inertness to trade wastes, as well as its many other advantages, "gets the nod" for Extra-Strength Clay Pipe in the world's largest bomber plant's waste disposal lines.

These are just a few typical Extra-Strength Clay Pipe successes where cradling and casement costs were not just cut but entirely *eliminated.* No wonder there's a new A. S. T. M. code C-200-44T covering this important new material. For your free copy, write today to

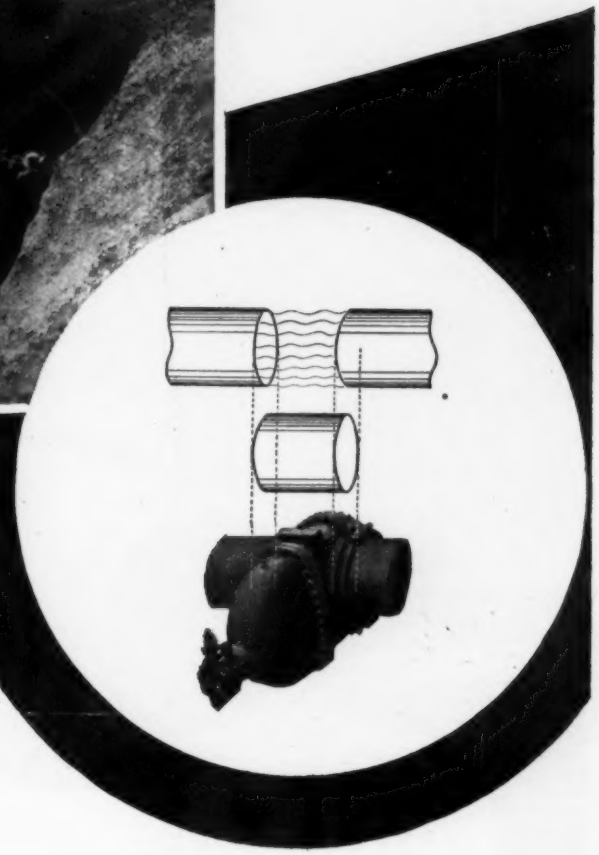
NATIONAL CLAY PIPE MANUFACTURERS, INC.
111 W. Washington St., Chicago 2, Ill.

C-1244-20

CLAY PIPE

"IT WILL PAY TO USE CLAY"

THIS 36" VALVE INSTALLED without shutting off flow



With a SMITH Valve Inserting Machine you can insert valves up to 48" in size *WITHOUT shutting off the flow, lowering pressure, or draining the line for as much as one minute.* There's no need of interrupting service, interfering with fire protection, riling the water, or transporting bulky pumping equipment to the point of insertion. The entire operation is simple and economical. Insertions can be made on any kind of pipe—cast iron, steel, wood or asbestos-cement.

SMITH Valve Inserting Machines are available either for outright sale or rental. Write for information.

FIRE HYDRANTS
GATE VALVES
CHECK VALVES
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

Cuts Sewage Carrying Costs— ALL ALONG THE LINE!

LOWER handling costs . . . faster assembly . . . less infiltration . . . high carrying capacity . . . these are some of the ways Transite Sewer Pipe provides important economies *all along the line*—in handling, installation and performance!

And here are the reasons why:

Long lengths, light weight. Transite Sewer Pipe is made in long 13-foot lengths. That means fewer joints . . . more footage per day. Its light weight also speeds up installation, reduces handling costs.

Tight sleeve-type joints. To guard against costly infiltration and keep down the load at the disposal plant, Transite has a sleeve-type joint combining flexibility with tightness. Easily assembled, *stays* tight in service.

Smooth interior surface. An advantage that assures high carrying capacity (Kutter's n=0.010). This frequently permits the use of smaller pipe, or flatter grades with shallower trenches.

An asbestos-cement product. Made of asbestos and cement compressed into a tough, dense, homogeneous structure, Transite Sewer Pipe is strong, durable and highly resistant to destructive agencies underground. Its efficiency and economy has been proved through the years under a wide range of service conditions.

If your plans include sewage works improvements, write for Brochure TR-21A which gives the facts about Transite Sewer Pipe. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

JM PRODUCTS

Johns-Manville TRANSITE *SEWER* PIPE

FOR EFFICIENT, ECONOMICAL SEWAGE DISPOSAL

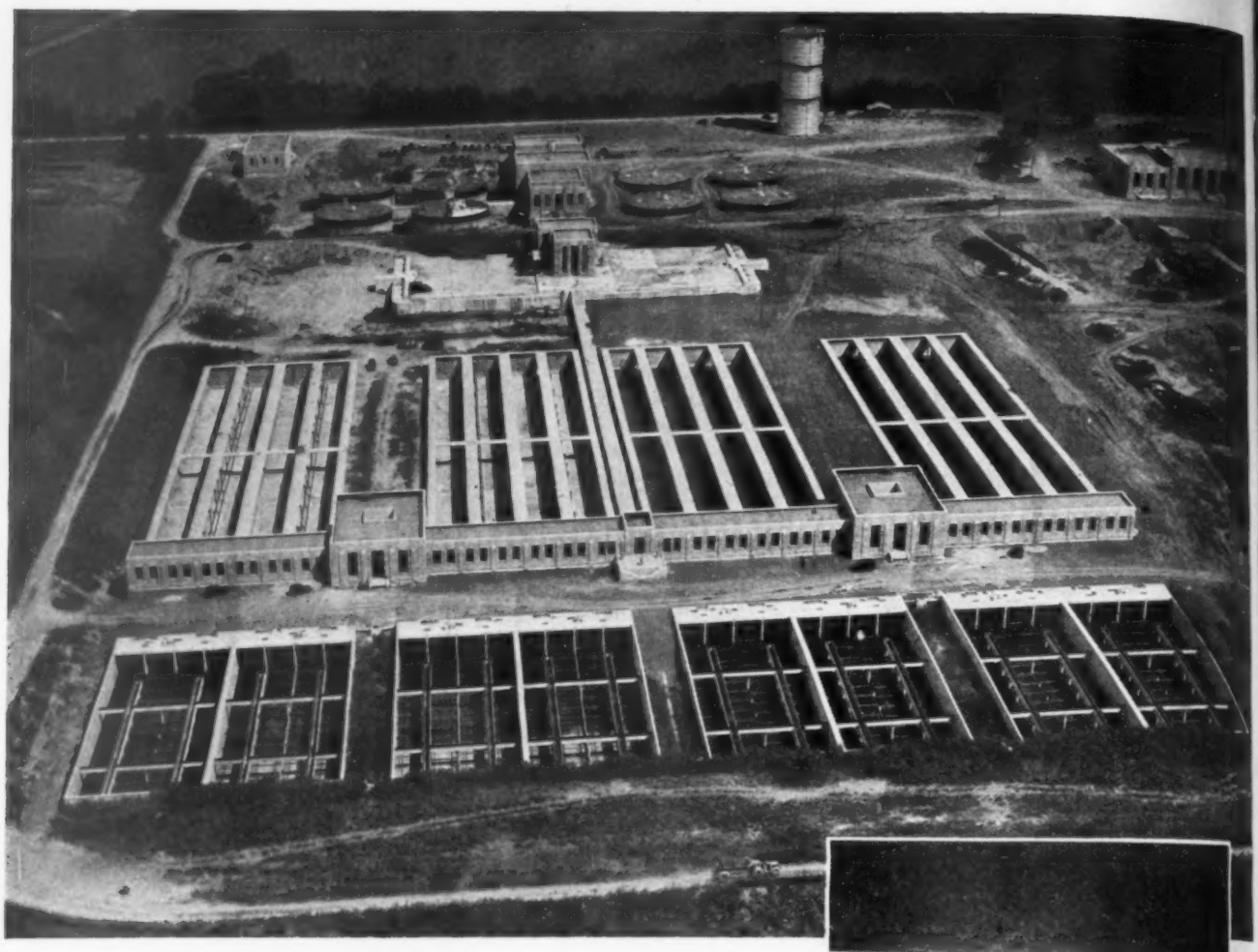
SAFEGUARD YOUR WATER SUPPLY WITH THE HELP OF

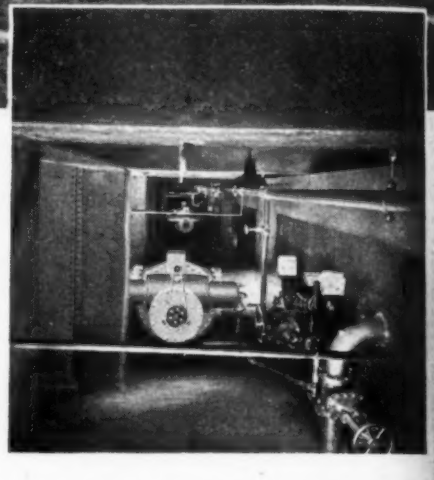
The dependable quality and uniformity of DIAMOND LIQUID CHLORINE is an asset in water treatment and purification. Delivered in single unit tank cars, multi-unit tank cars and cylinders to meet your needs.

DIAMOND ALKALI COMPANY

PITTSBURGH, PA., *and everywhere*

DIAMOND LIQUID CHLORINE





ROTOVALVES

by

S. MORGAN SMITH COMPANY

For CHECK SERVICE with RAW SEWAGE PUMPS

In the Sewage Treatment Plant of the CITY of COLUMBUS, Ohio

SAFEGUARDING the two 55 m.g.d., and the two 27½ m.g.d. motor driven Raw Sewage Pumps, the four Roto Check Valves perform an essential service, in this modern and important Plant.

One of the very interesting characteristics of this installation is that they are located downstream from the throat of the Venturi meters, which are set between the pumps and the check valves. These four valves are included in a total of 48 S. Morgan Smith Company Rotovalves used in this plant for miscellaneous services on air, sludge and sewage lines.

Write us for more complete information, when you are planning Sewage Plants.

S. Morgan SMITH Company

YORK • PA.

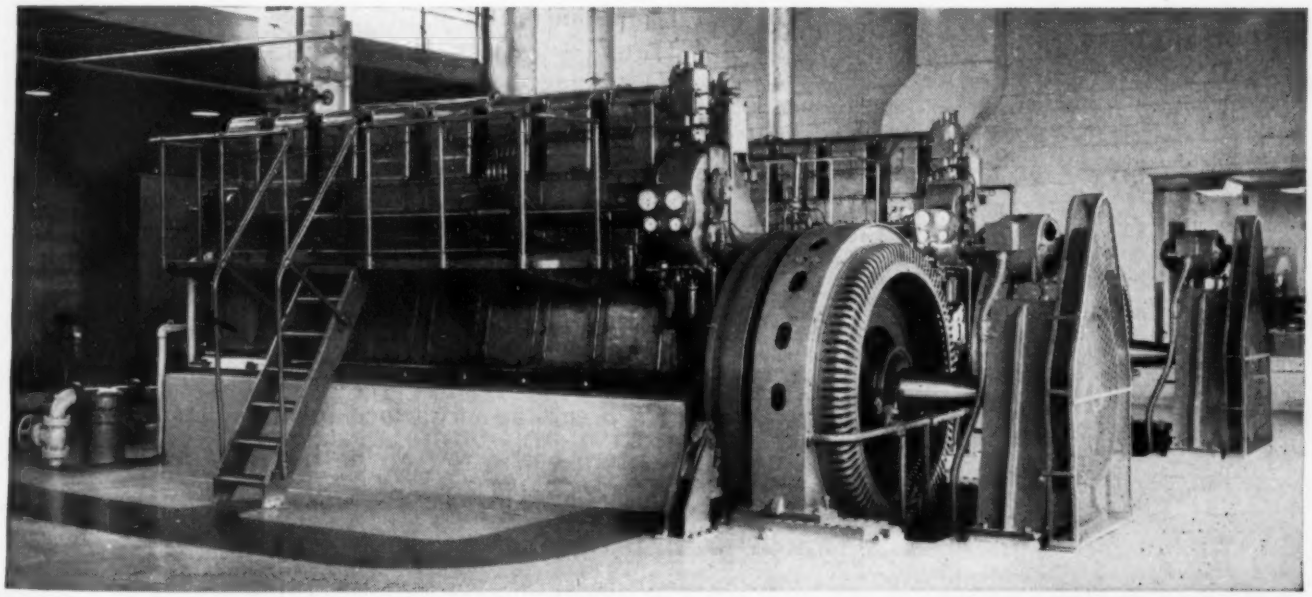
Eight times Around the World Non-Stop!

THE two 8-cylinder Cooper-Bessemer Diesels shown below have been in constant operation for 17,000 hours. Thus piston travel alone, in each of the sixteen cylinders, exceeds the equivalent of a non-stop trip eight times around the earth!

Seems incredible, especially when you consider all the allied engine parts such as rings, liners, bearings, pins and valves. Still there is no evidence whatever that any repair or maintenance is needed — and there never has been! Since standby engines were unobtainable despite greatly increased power demand, such dependability has been welcome, indeed.

This case history is not intended to discourage planned or pre-timed maintenance, but it does provide further evidence that exceptional stamina, unusual resistance to wear, and prolonged efficiency are Cooper-Bessemer engineering accomplishments — advantages that are downright life-savers in an emergency . . . certain in any case to protect the profit side of your ledger.

Cooper-Bessemer welcomes the chance to cooperate with you or with your consulting engineers in determining the correct engines for your requirements . . . stationary or mobile, on land, at sea, or on the rails.



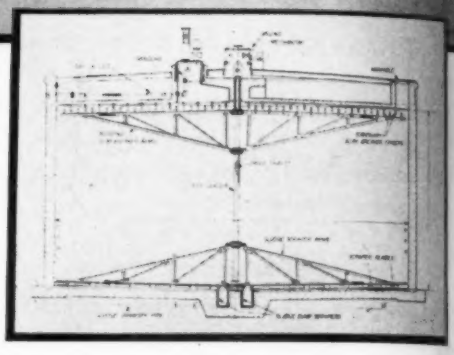
These two Cooper-Bessemer engines, Type JS 8-cylinder 600 hp diesels, are installed in the R.E.A. Tri-County Electric Cooperative at Portland, Michigan. Under the supervision of Mr. S. Don King, Superintendent, they have piled up 17,000 continuous operating hours without repair and with no indication that any maintenance whatever is needed.

THE Cooper-Bessemer CORPORATION

Mt. Vernon, Ohio • Grove City, Pa.

NEW YORK WASHINGTON HOUSTON DALLAS TULSA SHREVEPORT LOS ANGELES ST. LOUIS SEATTLE

CARTER DIGESTERS



FOR FIXED ROOF TYPE TANKS

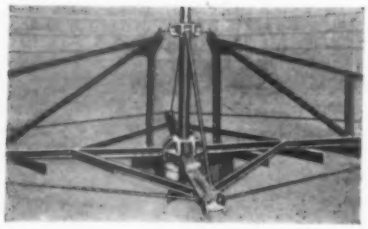
Ruggedly constructed . . . designed and developed to meet the maximum demands of the toughest job in sewage treatment — a unit of tremendous strength with proven ability under continuous heavy load duty. That's the CARTER mechanism for fixed roof sludge digesters.

DESIGN

Careful investigation, sound engineering and thorough testing in both laboratory and field installations have always proved new CARTER developments before they appear on the market. This coupled with experienced design assures you the finest in mechanical equipment.

FABRICATION

"Custom built" aptly describes the fabrication of CARTER mixing mechanisms. Variations in size, speed and tank requirements give each particular job a character of its own. Our facilities are such that we are prepared to build equipment to your most exacting requirements.



ERECTION

Simplicity of design, care in fabrication and complete assembly information facilitates proper erection of CARTER mechanism. This plus the services of a CARTER field engineer to inspect, adjust if necessary and supervise initial operation guarantees proper installation.

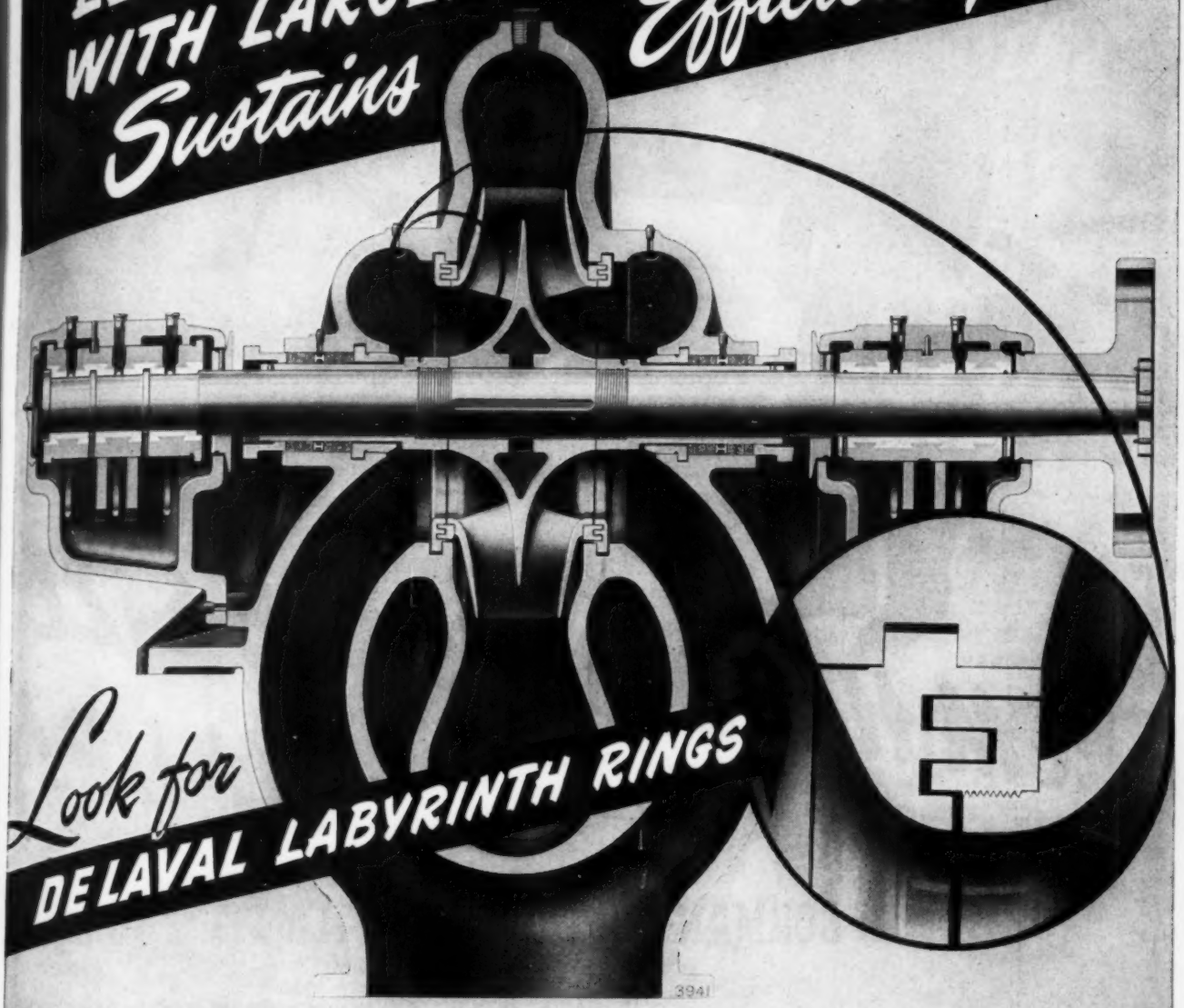
We've placed the emphasis on *tough* for this unit. Perhaps nowhere in the field will you find a revolving mechanism measuring up to CARTER standards. Rigid tests and inspections along with painstaking care in fabrication add up to a more durable, more efficient and a less costly unit to operate.

From drive mechanism to sludge sump scrapers, we've designed to give you the best. Our drive consisting of a double parallel gearhead motor direct connected to a totally enclosed triple reducer, rotates each unit with a slow, positive motion, which aids digestion and continuously breaks up all surface scum accumulations. These are only a few of the features. Bulletin 4311 tells the complete story. Write for it today.

RALPH B. CARTER COMPANY

Main Office: HACKENSACK, N. J. New York Office: 53 PARK PL., NEW YORK 7, N.Y.

LESS LEAKAGE WITH LARGER CLEARANCES Sustains Efficiency



Look for DE LAVAL LABYRINTH RINGS

De Laval Labyrinth Wearing Rings contribute in a large measure to sustaining the high efficiency of De Laval pumps. The large clearance, tortuous labyrinth passage reduces leakage to a minimum and maintains ample running clearances under all conditions.

For sustained efficiency and reduced maintenance costs look for De Laval Labyrinth Wearing Rings when buying centrifugal pumps.

3235

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG

FROM HAND-BAGGAGE SIZE . . . ON UP!

GORMAN-RUPP PUMPS WILL FIT YOUR JOB

You may want a pump as small and easy to carry as a bag of tools - Gorman-Rupp has such a pump that will deliver as much as 3,000 gallons per hour. Or, you may have a heavy de-watering job that calls for as much as 125,000 gallons per hour at continuous operation. Whatever the size or application – get one of those dependable, Gorman-Rupp BLUE pumps!

If you want a self-priming, centrifugal pump that never has to be shut down to be cleaned out get a dependable Gorman-Rupp BLUE pump, which has no recirculation orifice to get plugged or control valve to get jammed.

For size, for weight, for power, for cost – Gorman-Rupp self-priming centrifugal pumps can't be matched! Our nearest distributor will send you one and let you be the judge. If it doesn't do a better pump job than any other you have seen, return it at our expense – and it won't cost you a cent!

GORMAN-RUPP PUMPS
ARMY NAVY
UNSURPASSED FOR PUMPING FAST

THE GORMAN-RUPP COMPANY

MANSFIELD · OHIO

Your Sludge Can help ease the Food Shortage

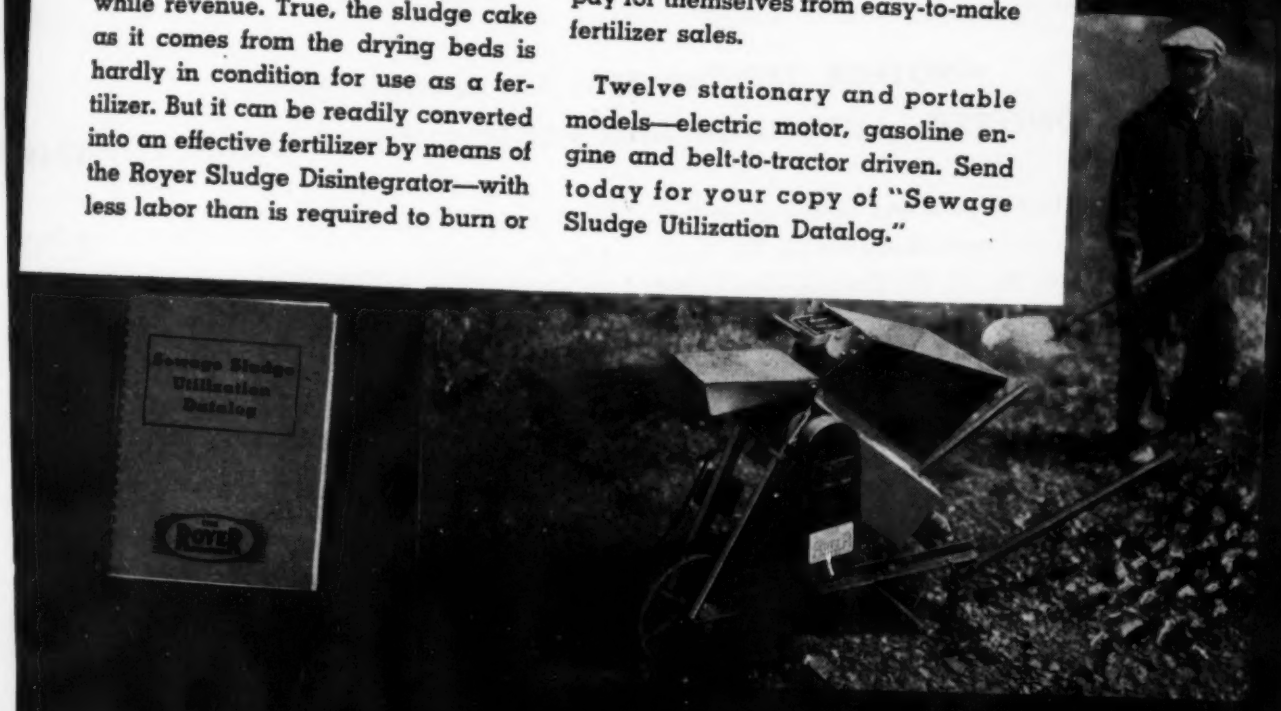
A food shortage is one of those things about which we Americans thought: "It can't happen here." But it has happened! More imperative than ever is the need of greater food production—and that calls for more fertilizer. Every source of fertilizing material must be utilized to the utmost.

Incinerating or burying sewage sludge under present conditions is a most flagrant form of waste—equivalent to wasting food in large amounts. Your sludge contains high fertilizing values which definitely and substantially increase food crops.

Hundreds of sewage disposal plants, in communities large and small, are converting their sludge into fertilizer; enhancing local food production and at the same time enjoying a worthwhile revenue. True, the sludge cake as it comes from the drying beds is hardly in condition for use as a fertilizer. But it can be readily converted into an effective fertilizer by means of the Royer Sludge Disintegrator—with less labor than is required to burn or bury it. Just shovel the sludge cake into the hopper.

These rugged, inexpensive machines thoroughly shred, mix, aerate and further dry the sludge. Sticks, stones and trash are automatically removed. Royers discharge onto pile or truck a ready-to-use and marketable fertilizer. Chemicals may be added in the same process to make a high strength fertilizer. Royers soon pay for themselves from easy-to-make fertilizer sales.

Twelve stationary and portable models—electric motor, gasoline engine and belt-to-tractor driven. Send today for your copy of "Sewage Sludge Utilization Datalog."



ROYER

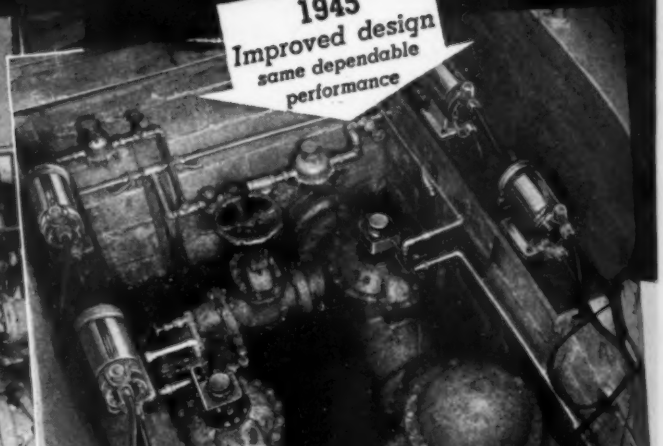
PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

WINCHESTER, MASS.
RE-ORDERS %PROPORTIONEERS%

At South Station, the 4 original, Automatic and Proportional Chlor-O-Feeders modernized with Plastic Heads are still in use.



North Station showing installation of 4 latest Automatic and Proportional Chem-O-Feeders.

ANOTHER TYPICAL SERVICE RECORD OF %PROPORTIONEERS% AUTOMATIC AND PROPORTIONAL CHEMICAL FEEDERS

Ten years ago the Water and Sewer Board of Winchester, Mass., through its chairman, Mr. E. C. Sanderson and Supt. Mr. H. W. Dotten, purchased four %Proportioneers% Automatic and Proportional Chlor-O-Feeders, paced by two Hersey Detector Meters, (control range 40 to 6400 g.p.m.) to sterilize the entire Winchester water supply. In 1936 four additional %Proportioneers% Chemical Feeders of larger capacity were installed for injecting lime slurry as made up continuously by Omega disc type dry feeders. The original Chlor-O-Feeders, now with Plastic Heads, are serving dependably at North Station, two feeding hypochlorite and two Calgon.

In 1945, the same Water and Sewer Board members, thoroughly satisfied with the performance of this equipment, selected the latest %Proportioneers% Automatic and Proportional Chem-O-Feeders to handle the hypochlorite and Calgon feeding at the North Station.

%Proportioneers, Inc.% is continually working to design and produce the best proportioning equipment available at a reasonable price.

PUT YOUR PROBLEM IN THE MAIL TODAY FOR PROMPT RECOMMENDATION AND QUOTATION

% PROPORTIONEERS, INC. %

9N CODDING ST., PROVIDENCE, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

Orifices—Their Selection and Use
This contribution was promised several months ago. Inasmuch as it turned out to be a veritable treatise on the subject, and inasmuch as the paper use restrictions became worse rather than better, we have so far been unable to print this valuable material which we are reluctant to split into two or more parts for publication. We merely wish our readers and the author to know what has delayed publication. Those who are acquainted with his earlier productions we know are anxious to have this reference work (a veritable handbook on "Orifices") by—
D. R. TAYLOR, Major,
Corps of Engineers, U. S. Army.
(Formerly Supt., Roanoke, Va., Water Dept.)

Electronics in Water and Sewage Works of Tomorrow
Is the captivating title of an article the context of which we prefer not to review, and rather depend upon the curiosity of the reader to keep a look-out for this article. Enough to say that it reveals where the application of electronics bids fair to give us much that is new to talk about in the post-war era of water and sewage works design instrumentation and operating practices. The author is—
D. M. NEILSEN, Development Engr.,
The Foxboro Co. (Electronics Division).

Swat That Fly!
Is a timely discussion of successful methods for the control of the house fly as well as filter flies and other types which may breed around sewage treatment plants, creating not alone a nuisance but also a reflection on the plant management if not also an actual health hazard. The author is—
DR. GEO. E. SYMONS, Assoc. Editor,
Water Works and Sewerage.

A Unique Solution Feeder
Has been constructed by an eminently practical operator for feeding activated carbon in suspension at a small filter plant. It is inexpensive and has performed satisfactorily. The same design of feeder would serve admirably for feeding hydrated lime, clay for bettering coagulation, the so-called "mud alum" or "activated alum" or any other material in suspension. The description of this feeder comes from "inventor"—
VESTER OPIE, Chief Engineer,
Dept. of Water and Light, Paris, Mo.

What Water Metering Means to a Community
This article, originally in Spanish, was prepared at our request for inclusion in our forthcoming *Manual de Ingeneria Sanataria*, which is to be the Latin-American counterpart of our annual Reference and Data Number. The article contains so many fundamental arguments and concepts in water metering, that we have had it translated. The author—
DR. GEO. C. BUNKER, Consltg. Engr.,
Natl. Inst. of Sanitary Wks., Caracas, Venezuela.

Lubricated Plug Valves vs. Gate Valves in Sewage Works
Is one man's opinion of when each of these types of valves should be used, and the problems each presents in a sewage work. That "one man" with considerable experience is—
E. A. LOCKE, Ass't Engr. in Charge,
Sewage Treatment Works, Hartford, Conn.

Trickling Filter Operation and Results
Is a three-part treatise on the interpretation of single and two-stage high capacity trickling filter results and the chief causes of poor results. This exhaustive study, with particular reference to "Aero-filters" has been made by—
J. A. MONTGOMERY, Chief Engineer,
Lakeside Engineering Co., Chicago.

Replacing a Six Inch Valve Within a Sludge Digester
Is no simple matter when the tank can not be emptied. How this job was ingeniously accomplished without emptying the digester is explained and illustrated by—
ROBERT C. URBAN, San. Engr.,
Corps of Engineers, Fort Totten, N. Y.

VOL. 92, NO. 8

CONTENTS

AUGUST, 1945

Cross-Connection Rules 237
By John H. Murdoch, Jr., Principal Attorney
American Water Works and Electric Co., Inc.
New York, N. Y.

A Simplified Bacteriological Procedure for the Examination of Water 241
By Charles A. Hunter, Ph.D.; Eleanor Patty, A. B., and Flora McKinley, M. S.
Kansas State Board of Health
Topeka, Kansas

Today's Standard Gate Valves Subject to Improvement..... 243
By G. L. O'Brien, Designing Engineer
Bureau of Water
Baltimore, Maryland

Louisiana Conference's Eighth Annual Short Course..... 246

More Real "Blueprint Now" Action!..... 248

The Autoxidation Process 249
By Harmon E. Keyes, Consulting Chemical and Metallurgical Engineer
Phoenix, Arizona
and
Dario Travaini, Superintendent
Sewage Treatment Works
Phoenix, Arizona

Chemical Treatment of Soapy Waste Waters..... 255
By Harry W. Gehm, Associate
Dept. Water & Sewage Research
New Jersey Agr. Expt. Station
New Brunswick, New Jersey

Sludge Pumping—A Better Way..... 258
By Charles Yeomans, President
Yeomans Brothers Co.
Chicago, Illinois

Straight From Our Readers..... 261

Editorial 264

Meetings Scheduled .....Ad. Page 74

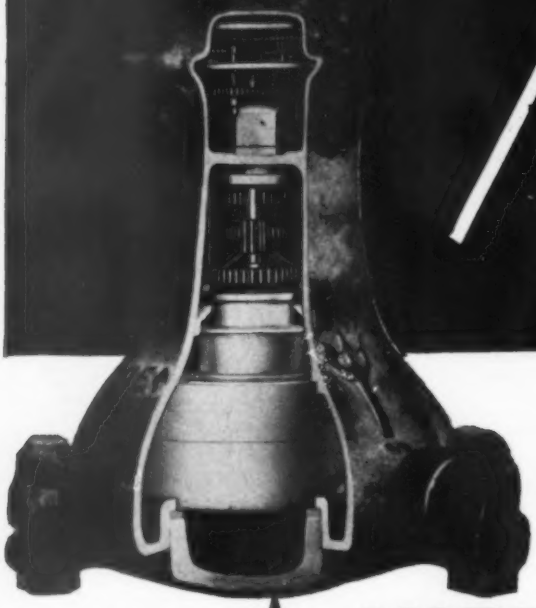
Here and There with "Doc" Symons..... 76

Manufacturers' and Equipment News.....Ad. Page 81

Literature and Catalogs Received..... 92

H. P. GILLETTE, Pres.; E. S. GILLETTE, Vice Pres. and Publisher; L. H. ENSLOW, Vice Pres. and Editor; J. C. BLACK, Mgn. Editor; GEORGE E. SYMONS, Associate Editor; Editorial Associates—J. R. BAYLIS, A. M. RAWN, H. A. FABER; H. J. CONWAY, Adv. Editor; L. D. SANDERS, Make-Up Editor. *Chicago Office*, Norman T. Burke, Rep., 330 S. Wells Street; *Cleveland Office*, Lee B. McMahon, Mgr., Leader Bldg.; *New York Office*, J. M. Angell, Jr., Mgr., 155 East 44th Street; *Los Angeles Office*, Don Harway, Rep., 816 W. Fifth Street.
WATER WORKS & SEWERAGE is a monthly publication. Single Copies, 25 Cents; Subscription Rates U. S. and Canada, $2.00 per year; Foreign, $3.00 per year.

Trident because



Modern Interchangeable Parts in an 1899 Trident Water Meter

You get all these exclusive advantages through TRIDENT

INTERCHANGEABILITY

Economy in Inventory

New parts fit all models. No obsolete parts needed for old models. You get real standardization.

Efficiency in Maintenance

No time lost selecting replacement parts. Parts fit perfectly, saving labor. Fewer meters returned from the Test-Bench for re-work.

Reliability in Performance

Modern improvements in new parts mean a higher standard of reliability in repaired Tridents.

Assurance Against Depreciation

Interchangeable parts are your assurance that your Tridents do not become obsolete through future improvments.

Utmost in Revenue

Interchangeable parts permit you to increase your standards of accuracy for repaired meters at the Test-Bench.

Yesterday Today Tomorrow

THE SYMBOL OF SUSTAINED ACCURACY

NEPTUNE METER COMPANY • 50 West 50th Street • New York 20, N. Y.

Branch Offices in CHICAGO, SAN FRANCISCO, LOS ANGELES, PORTLAND, ORE., DENVER, DALLAS, KANSAS CITY, LOUISVILLE, ATLANTA, BOSTON.

Neptune Meters, Ltd., Long Branch, Ont., Canada

125r

WATER WORKS & SEWERAGE

VOL. 92, No. 8 *A Gillette Publication* AUGUST, 1945

CROSS-CONNECTION RULES

A Water Company Moves to Assume Its Moral Responsibility

By JOHN H. MURDOCH, JR.
Principal Attorney
AMERICAN WATER WORKS AND ELECTRIC CO., INC.,
NEW YORK, N. Y.

SOME recent epidemics of waterborne diseases have shocked water works operators into thought and action on an old problem. These epidemics have demonstrated to many what had been previously realized by some, namely; that if lines carrying potable water are connected directly or indirectly with facilities carrying water of questionable character or containing chemicals, impurities or deleterious matter of any kind there is always a possibility of the potable water becoming contaminated. Such contamination may result, as an illustration, when the pressure in the lines carrying the potable supply is so reduced that it is lower than the pressure in the connected lines carrying questionable water and the questionable water becomes mixed with the potable water. Or back-syphonage due to reduced pressure may draw contaminating matter into the potable water supply lines of the premises. Such contamination might even be drawn into the general distribution system of the water purveyor, thus endangering the health of the general public and not merely those on the premises directly involved. These potential hazards impose a moral responsibility on water works operators beyond that of merely putting potable water into the distribution system. There is the added responsibility of taking reasonable precautions to guard the water in transit.

The Author

In recognition of this added moral responsibility all of the seventy odd operating water companies in the American Water Works and Electric Company system have recently adopted new rules and regulations concerning cross-connections and interconnections. These rules with their forms are set forth, complete, at the end of this article. In them a cross-connection is defined as ". . . any pipe, valve, or other arrangement or device connecting the pipe lines of the company . . . with pipes or fixtures supplied with water from any source other than the lines of the company." Under this definition there is a "cross-connection" if the company supply be connected with a second source even though the second source of supply be another public water supply system furnishing approved potable water. However, the company classifies that special type of cross-connection, if made with the knowledge and consent of the company, as an "acceptable cross-connection."

Classification of Cross-Connections

All other cross-connections are classed as "objectionable." The company makes it a violation of its rules for any customer to install any new "objectionable" cross-connection and will have the right to discontinue water service to a customer violating this rule.

"Objectionable" cross-connections installed prior to the new rules may be brought into a class known as "tolerated cross-connections" if they meet all the requirements for such classification. The requirements are found in the definition included in the rules and in the substance of the various "Forms." It should be noted that an "objectionable cross-connection" cannot be classed as a "tolerated cross-connection" if it in any wise lacks conformity with health department or plumbing regulations. On the other hand, a cross-connection might measure up to such rules and regulations and still not be accepted by the company as "tolerated." The sanitary engineer, manager and president of the water company might feel that they were not justified in jeopardizing the health of consumers through continuance of service to a customer having a cross-connection installation meeting public regulatory standards but still, in the opinion of company officers, constituting too serious a potential hazard. Conformity with public regulations is a prerequisite to qualification for "toleration," but such toleration is a subsequent independent action by the company in performance of its public obligations.

At this point, as an aside, the writer would like to suggest to health authorities that the word "approve" be not used by them in passing on applications for cross-connections. "Approve," to most minds, carries the idea of "esteeming as good" and not the idea of a reluctant consenting to something less than a completely desirable condition. As it is now recognized that all cross-connections are undesirable as constituting sanitary defects in a potable water supply system, surely it is better merely to "tolerate" those meeting certain standards than, by the use of the word "approve," to give the owner of the connection the idea that the cross-connection is good and given a blessing by a public finding to that effect.

Under the American Water Works system's new rules, the continuance in existence of an objectionable cross-connection which has not been brought

into the class of tolerated cross-connections would constitute grounds for discontinuance of water service. Since no new objectionable cross-connections will be permitted and since even existing tolerated cross-connections are continued on a merely temporary provisional basis, and since the owner of a tolerated cross-connection assumes rather heavy legal obligations in applying for continued water service to the premises, it is the company's expectation that in the near future it will be rid of known cross-connections except those with other adequately supervised public systems of potable water supply.

Interconnections

The company has defined an interconnection as "a plumbing arrangement, other than a cross-connection, by which contamination might be admitted or drawn into the distribution system of the company, or into lines connected therewith, used for the conveyance of potable water." There is support in the literature of the subject for this use of the word interconnection; however, in some states "interconnection" is used to refer to connections between two public water supply systems. There is not any generally accepted terminology for the various desirable and undesirable connections in water systems, so that it was necessary for the company to formulate its own terms and definitions of those terms. Perhaps the terminology could be improved but the use of phrases in the rules has been consistent with the definitions there established.

Interconnections as so defined are infinite in variety, may be scattered throughout the premises, and may even be unusual management of perfectly proper facilities. Because of these recognized facts, the company in its rules contents itself with reserving the right to discontinue water service to premises: (a) on receipt of an order from public authorities on the ground of dangers to health because of the existence of dangerous or potentially dangerous interconnections on the premises or (b) when the company has knowledge that public authorities have ordered an existing interconnection on the premises broken or discontinued and has knowledge that such order has not been complied with in reasonable time.

Legal vs. Moral Responsibility

The writer of this article read a paper entitled "Legal Limits of Water Supply Systems" at the 1944 Meeting of the American Water Works Association. That paper was published in the August, 1944, issue of the association Journal and also in *Water Works and Sewerage* for August, 1944. It was ended with the following paragraph:

"Water works operators must be interested in potential health hazards which may affect the potable water supply. There is a moral responsibility on the operator to use his influence to bring about better plumbing practices. There is a moral responsibility to take necessary action within his rights and abilities to remove the hazard to the system from sanitary defects which he knows exist or should know exist. The water works operator should not let it be presumed that he has promised to perform that which he cannot perform."

By the new company rules, it is believed that this company has moved to assume the moral responsibility referred to in the quoted paragraph. All of the company's influence will be exerted toward the elimination of sanitary defects. Exertion of that influence should tend to educate the public in the dangers of cross-connections and interconnections and may cause many to cooperate. There will be violations of the company rules which will not always be detected but a sufficient number will be detected to constitute object lessons and the mere adoption and publication of the rules will, we believe, lessen the number of objectionable cross-connections.

It must be recognized that some customers of water service need secondary sources of supply. As an illustration this is true of steel plants which need huge quantities of water for cooling—water in such quantities that no general service water supply utility could supply it on an economic basis without imposing unreasonable burdens on general customers. However, the need for a secondary source of supply is no excuse for the installation of objectionable cross-connections. The two supplies should be kept apart or, if that be impracticable, the public supply should be fed into a tank with float control and the outlet of the public water supply line should be well above the maximum water line of the tank. Sterilization of the secondary supply may also be required as the health of those on the premises should be considered as well as the protection of those outside. These are matters in which health authorities should be active leaders. The American system group of water companies does not expect to increase its business through the elimination of secondary sources of supply on customers' premises, but it does intend to work for the protection of its lines from contamination and toward increased safety from waterborne disease.

Even "Tolerated" Connections Undesirable

As has been stated before in this article, the new rules have been adopted by all the companies in the system and are in the process of being legally filed and published. Representatives of the companies have discussed them at length with many state health department officials and those officials have all expressed themselves as being favorably impressed. In one instance, where the state prohibits what are classified in the rules as undesirable but "tolerated" cross-connections, the company rules for this state have been changed so as to conform with general state regulations. Companies of that state can have no "tolerated" cross-connections. Our only regret in this respect is that more states have not taken similar action. Several city councils have adopted ordinances legalizing the company rules. One state public utility commission granted the writer a hearing before the entire membership and then by formal vote permitted the rules to be filed as part of the tariff of all the system companies operating in the state.

Two remaining and all important steps are: the education of the public in the need for the elimination of improper cross-connections and interconnections and the enforcement of the rules. The company proposes to take both those steps.

The full text of the new rules follows:

RULES AND REGULATIONS*
TO COVER CROSS-CONNECTIONS AND INTERCONNECTIONS

PREAMBLE

Reason for Rules and Regulations Concerning Cross-Connections and Interconnections and Methods of Enforcement

THE Company accepts the judgment of various public health authorities that all connections or plumbing arrangements, which would or might permit water from other sources than the system of the Company or pollution or contamination from any origin to be drawn or admitted into lines carrying potable water furnished by the Company, constitute hazards to public health unless the connection be with a second source of supply which is an approved, acceptable, safe and sanitary source of public water supply. Even such an approved second source of supply should not be cross-connected with the supply from the Company lines unless such connection be approved by the health authorities and the Company.

The guarding of the potable water supply from or in the lines of the Company from possible contamination through objection-

*A supplement to the "Rules and Regulations" of the several companies of the American Water Works and Electric Co., Inc.

able connections on consumers' premises and outside of company-owned facilities depends, primarily, on the good sense, good faith and cooperation of the Company consumers, and next, upon vigorous action and cooperation from plumbing inspectors and public health officials. The Company, through the adoption of these Rules and Regulations and by continued enforcement of them to the extent of its ability, cooperates with consumers and with public officials in lessening the chances of contamination through objectionable connections.

CROSS-CONNECTIONS AND INTERCONNECTIONS

I. Definitions

When used in these Rules and Regulations the following words and phrases shall have the meanings herein provided:

(a) *Cross-Connection.* A cross-connection is any pipe, valve or other arrangement or device, connecting the pipe lines of the Company or facilities directly or indirectly connected therewith to and with pipes or fixtures supplied with water from any source other than the lines of the Company directly connected.

(b) *Interconnection.* An interconnection is a plumbing arrangement, other than a cross-connection, by which contamination might be admitted or drawn into the distribution system of the Company, or into lines connected therewith, used for the conveyance of potable water.

(c) *Acceptable Cross-Connection.* An acceptable cross-connection is a cross-connection having all of the following characteristics:

1. The source of the supply other than the lines of the Company directly connected is a source approved by the State Department of Health as an acceptable, safe and sanitary source of public water supply and which continues as such at all times while the cross-connection is in existence;

2. Installed or continued in existence with the knowledge and specific consent of the Company, and when installed on the premises of a consumer, or installed by a consumer, such consent to be evidenced by either: (A)—Communications on Forms 1, 2 and 3, set forth in Section numbered V of these Rules and Regulations concerning Cross-Connections and Interconnections; or (B)—Existing installations continued in existence on the written authorization of the president of the Company.

3. Installed or continued in existence and operated at all times in strict compliance with all applicable laws, ordinances, rules and regulations.

(d) *Objectionable Cross-Connections.* An objectionable cross-connection is a cross-connection other than an acceptable cross-connection.

(e) *Tolerated Cross-Connection.* A tolerated cross-connection is an "objectionable" cross-connection having all of the following special characteristics set forth under either A or B:

A. 1. Installed and in service before the ———— day of ————, 194—;

2. Called to the attention of the Company by written application for Continuance of Water Service (Form 1) from the owner or occupant of the premises on which the cross-connection exists within ten days from the receipt by such owner or occupant of notice of the adoption of these Rules and Regulations;

3. Continued in existence on a provisional and temporary basis after the ———— day of ————, 194—, without discontinuance of water service on recommendation of a sanitary engineer for the Company, evidenced by written communication to the manager of the Company (Form 2), and with the consent of the Company evidenced by written communication from the manager of the Company (Form 3).

Or, in the alternative:

B. 1. Installed and in service before the ———— day of ————, 194—;

2. Continued in existence on a provisional and temporary basis after the ———— day of ————, 194—, on the written authorization of the President of the Company.

II. Prohibition of Installation of Cross-Connections

After the ———— day of ————, 194—, no cross-connection shall be installed or made unless such cross-connection shall be an "Acceptable Cross-Connection," as defined in these Rules and Regulations, and the installing or making or the causing or permitting of the installation or making of a cross-connection, other than an Acceptable Cross-Connection, after the said ———— day of ————, 194—, shall constitute a violation of the Rules and Regulations of the Company.

III. Prohibition Against Continuance in Operation of Existing Cross-Connections

After the ———— day of ————, 194—, no cross-connection shall be continued in operation or existence unless such cross-connection has and continues to have at all times the special characteristics required to qualify it as either an "Acceptable Cross-Connection" or a "Tolerated Cross-Connection," as those terms are defined in these Rules and Regulations, and the causing or permitting by any consumer or any owner or occupant of premises of the continuance in operation or existence of such cross-connection not in the excepted classes shall constitute a violation of the rules and regulations of the Company.

IV. Right of Company to Discontinue Water Service for Violations of Company Rules and Regulations Regarding Cross-Connections or on Order of Public Authorities

In addition to any or all other grounds for discontinuance of service, the Company shall have the right to discontinue water service on reasonable notice, not to exceed ——— days, under either of the following circumstances:

1. Violation by a consumer or by a property owner or occupant of Company Rules and Regulations regarding Cross-Connections;

2. Receipt by the Company of an order from health authorities or plumbing inspectors to discontinue service to a premises on the ground of violation of Company Rules and Regulations regarding cross-connections, or on the ground of dangers to health because of the existence of cross-connections or interconnections on the premises;

3. When the Company has knowledge that health authorities or plumbing inspectors have ordered a cross-connection or interconnection, existing on the premises, to be discontinued or broken and such order has not been complied with.

V. Forms

APPLICATION FOR CONTINUANCE OF WATER SERVICE TO PREMISES ON WHICH CROSS-CONNECTION EXISTS

(Form 1)

Dated ————————, 194—

To ———————— Water Company:

Applicant, ————————, owner, occupant or water consumer at the premises known and described as follows:

————————

————————

does hereby make application for continuance of water service at said premises on which one or more cross-connections exist and makes representations and agrees and covenants as follows:

1. That the only cross-connections, within the definition of that term in the Rules and Regulations of the Water Company, existing on the above designated premises on the date of this application ———— located and described as follows:

2. That the blueprint— or drawing— attached to and made a part of this Application correctly and accurately portray the physical layout and details of construction of said cross-connection—

3. That the Applicant is familiar with all applicable rules and regulations of state and local health authorities and with any applicable laws, ordinances, rules or regulations concerning plumbing, and represents that the aforesaid cross-connection— may be continued in existence after the date of this Application without violating any such law, ordinance, rule or regulation.

4. That the Applicant will at all times operate and maintain the aforesaid cross-connection— in full compliance with any such law, ordinance, rule or regulation as is now in force, or as may hereafter be put in force by new enactment, promulgation, change, amendment or addition.

5. That the Applicant will make no change in the structure, character or method of operation of the aforesaid cross-connection— or create or install any new cross-connection— without prior specific and detailed written permission from the Manager of the Water Company issued pursuant to written recommendation from a sanitary engineer of the Water Company.

6. That the Applicant, for itself, its heirs, successors and assigns, hereby gives and grants to the Water Company the right, by its officers or agents, to enter upon and into the aforesaid premises at any reasonable time to observe and inspect the aforesaid cross-connection, or to determine for itself whether the Applicant has made any misrepresentation in this Application or has failed to keep and perform any agreement or covenant provided in this Application.

7. That the Applicant will either cause any cross-connection on its premises to be permanently and completely disconnected to the satisfaction of the Water Company or will not object to

discontinuance of water service to the premises, if, when or as any misrepresentation or failure of performance by the Applicant be discovered touching any matter covered by this Application; or if the aforesaid cross-connection be not installed, operated or maintained in such manner as will, in the opinion of the Manager or Sanitary Engineer of the Water Company, safeguard the interests of the Water Company or its other customers; or if, in the opinion of the Manager of the Water Company, conditions are such that the aforesaid cross-connection— may be permanently and completely disconnected without unreasonable hardship on the Applicant; or if, because of the nature of the aforesaid cross-connection— or the manner of operation, this Application be not granted by the Water Company; or if the Company be in receipt of an order from health authorities or plumbing inspectors to discontinue service to the premises on the ground of dangers to health because of the existence of cross-connections or interconnections on the premises; or if the Water Company has knowledge that health authorities or plumbing inspectors have ordered a cross-connection or interconnection existing on the premises to be discontinued or broken and such order has not been complied with.

8. That the Applicant, its heirs, successors and assigns, covenant and agree that it will indemnify and save the Water Company harmless from any and all loss, damage, liability, claim or demand, arising from, based upon or caused by any condition or occurrence traceable to the continued existence or operation, after the date of this Application, of any cross-connection on the premises of the Applicant, whether or not specifically mentioned in this Application.

Signed, sealed and delivered by the Applicant the day and year first above written.

_____ (SEAL)

By _____

ATTEST:

_____

(SEAL)

_____

(Blue prints or drawings of cross-connection— are to be attached to the communication Form 1.)

RECOMMENDATION OF COMPANY SANITARY ENGINEER

(Form 2)

Dated _____, 194—

To _____, Manager of _____ Water Company:

I have examined the attached Application for Continuance of Water Service to Premises on which a Cross-Connection Exists, and the blueprints or drawings attached thereto. I have also, either in person or by an assistant in whom I have confidence and for whose work I am responsible, made such inspection of the premises and the cross-connections covered by the said Application as I believe to be necessary. I have also made myself familiar with the applicable laws, ordinances, rules and regulations.

On the basis of my examinations, studies and inspection, but relying upon the accuracy and truth of the representations made by the Applicant as to all matters where careful visual inspection could not reveal all facts and circumstances, I hereby recommend that the Water Company _____ continue water service to the premises covered by the Application without requiring the permanent and complete disconnection of the cross-connection— existing thereon and mentioned in the Application.

_____

Sanitary Engineer for _____ Water Company

AUTHORIZATION

(Form 3)

Dated _____, 194—

To _____ Applicant

Acting in reliance upon your representations, agreements and covenants, and also on the Recommendation of the Sanitary Engineer for the Water Company, the Water Company will continue water service to the premises covered by your Application without requiring that you permanently and completely disconnect the existing cross-connections mentioned in your Application.

The granting of your request in your Application is subject to the understanding that service will be continued to the premises in question without permanent and complete disconnection of the cross-connection; only so long as the premises are owned or occupied by you or your heirs, or (if you are a corporation) by your successors in corporate existence; only so long as all representations made by you in your Application continue to be true, and only so long as you faithfully perform all of your agreements and covenants provided in your Application; and distinctly and specifically subject to the terms of paragraph 7 of your Application; and will be subject to review and re-examination not less frequently than once a year from this date.

_____ Water Company

By _____

Manager

Priority Regulations to Be Discontinued at Year End After Six Month Transition Period

Priority Regulation 29, dated June 30, 1945 has been issued by W.P.B. to explain how and when the present priority ratings AA-5 to AA-1 will be discontinued at the end of the current year.

The present system of AA ratings (AA-1, AA-2X, AA-3, AA-4, and AA-5) and the controlled materials plan will be discontinued at the end of 1945 and will be replaced by an AAA for emergencies, and a new MM rating for military agencies.

During the transition period (from now until Dec. 31) the AA rating system remains in effect except that after Oct. 1, 1945 no AA ratings will be assigned except for deliveries to be made *before* Jan. 1, 1946, and all outstanding AA ratings on orders for delivery after Jan. 1, 1946 will be cancelled before Oct. 1, 1945.

On Oct. 1, all orders which carry AA ratings, not previously cancelled, and which call for delivery after Jan. 1, 1946 will automatically become unrated (unless military orders), and suppliers who receive such orders with AA ratings must disregard the ratings.

AA ratings may still be used until Oct. 1, 1945 and although such ratings become invalid on that date, suppliers cannot be sure that orders carrying AA ratings for delivery in 1946 will not be confirmed under the new rating system and they must therefore accept such orders and keep them in their schedules until Oct. 1 when it will be determined if such orders will be confirmed.

At the end of December 1945, the Controlled Materials Plan and all regulations and directions under it will automatically expire except CMP Reg. 2 restricting inventories.

During the third and fourth quarters of 1945 deliveries of controlled materials will continue to be controlled by the Controlled Materials Plan *alone* and not by ratings.

CMP Regulations 5 and 5A, and the P and U. orders assigning priorities assistance for maintenance, repair and operating supplies remain in effect through Dec. 31, 1945 unless previously revoked. The use of AA ratings and CMP allotment symbols is subject to the restrictions stated above with respect to deliveries of any materials after Jan. 1, 1946.

Under the new rating system after Dec. 31, 1945 ratings will generally not be given for MRO supplies on a blanket basis similar to CMP Reg. 5 and 5A and present P and U orders.

AA ratings will continue to be assigned during the transition period for equipment required for war supporting and essential civilian activities.

In a few cases WPB may assign MM ratings for construction but application for such rating should not be sought until after consultation with appropriate officials.

As will be noted Priority Reg. 29 is of interest not only to manufacturers, but *also to everyone operating under the present priorities system.* A companion Priority Reg. 28 is of particular interest to manufacturers.

Priority Reg. 3 as amended July 3, indicates the items which cannot be obtained with blanket MRO ratings and which will require specific authorization from the War Production Board.

A SIMPLIFIED BACTERIOLOGICAL PROCEDURE FOR THE EXAMINATION OF WATER

By CHARLES A. HUNTER, Ph.D.,* ELEANOR PATTY, A.B., and FLORA McKINLEY M.S.

Public Health Laboratories
KANSAS STATE BOARD OF HEALTH
TOPEKA, KANSAS

THE primary object of the bacteriological examination of water is to determine whether it is safe for domestic use. The procedure should be simple, rapid and efficient,—a procedure which all laboratory workers can follow with a minimum of deviations. Changes have been made in each new edition of *Standard Methods of Water Analysis* attempting to improve and to increase the efficiency in detecting and identifying the coli-form groups of organisms. But, with the addition of special tests and details of procedures there also arises the possibility of losing sight of the *real* object of water analysis.

The latest edition of *Standard Methods*[1] recommends that lactose broth be used for the presumptive test —taking gas formation to be an indication of coliforms. It is recognized that the formation of gas may be due, not only to coliforms, but to lactose fermenting spore formers, to synergism, or entrapped air. And, due to the possibility of false positive reactions, it is necessary to run confirmatory tests on *all* tubes showing gas formation, thereby making the so-called presumptive test little more than an enrichment culture. Gas production as an indication of positive presumptive tests is not reliable due to the difficulty for some laboratory workers to determine if gas has formed or not. Some workers consider the presumptive test negative if the amount of gas observed within the inverted tube is less than 10% by volume. Also some workers try to decide whether the gas is actually due to fermentation or is largely entrapped air. All of these personal interpretations are deviations from the Standard Methods and, therefore, the results may not be reliable.

*The senior author is Director of Laboratories.—Ed.

A Comparison

Above is equipment required in Standard Methods procedure for making the presumptive test. Below, the equipment required in the simple Bottle Method—8 oz. graduated culture bottle and water sample.

Many Methods Looking to Improvement Proposed

Many methods have been proposed for the elimination of false presumptive tests by adding various chemical agents (see 2-13 inclusive in appended reference list), but most of them have not proved satisfactory.

The importance of false presumptive tests can be illustrated by considering the results of the bacteriological examination of 764 water samples. Positive presumptive tests were obtained in 595 waters, of which only 460 confirmed, thus 135 samples or 22.7% gave false positive presumptive tests.

It is the opinion of the authors that, so long as mere gas formation is accepted as a basis of the presumptive test, little improvement can be made. There is a real need for a simple, efficient and economical method which will get rid of some of the pitfalls, and needless work and time requirements, in our present Standard Methods.

Techniques

These pictures compare the more tedious, time and equipment consuming and expensive procedure of the Standard Method (left) with the simple and inexpensive Bottle Method (center) of setting up the water sample in the graduated culture bottle; and (right) transferring a loop of enrichment culture from incubated bottle to confirmatory fermentation tubes.

A Simplified Method Suggested

The method to be reported here, is a modification of a method first recommended by Weiss and Hunter.[14] This method uses a larger quantity of water and eliminates gas production in the presumptive test, thereby preventing false positives. It is a simple, reliable economical method. Various experiments with this method have been carried out on several thousand samples of water during the last two years. The outline of the methods used in this series of experiments follow:

Bottle Method

Materials

(1) *Bottles*:
Graduated 6 or 8 oz. inexpensive and easily handled screw cap prescription bottles.

(Most of the botttles, at the present time, have plastic caps and are of various composition. Some caps, upon sterilization, give off ammonia or formaldehyde which may be absorbed by the medium and may affect the growth of the organisms. It is recommended that experiments be run on each lot of caps to determine whether volatile toxic substances are formed on sterilization. The use of glass stoppered, graduated bottles would be better.)

(2) *Medium (Concentrated)*

Tryptose	400.00 grams
K_2HPO_4	40.00 grams
KH_2PO_4	20.00 grams
Water	1000.00 cc.

Filtration and adjustment of pH is not necessary. Final pH is 6.8 to 7.0. Add 5 cc. to each bottle and sterilize at 15 pounds for 15 minutes.

(3) *Confirmatory Medium*
Brilliant green lactose bile 2%. Use in fermentation tubes.

Procedure

(1) *Enrichment Culture*
(a) To each bottle containing 5 cc. of the concentrated broth add 100 cc. of the water sample.
(b) Incubate broth at 37°C. for 18 to 24 hours.

(2) *Confirmed Test*
(a) Shake bottle well and transfer one loop (not less than 3 mm. in diameter) of the broth from the bottle to a brilliant green lactose bile fermentation tube.
(b) Incubate the fermentation tube at 37°C. for 48 hours.
(c) The presence of gas in any amount within 48 hours constitutes a positive confirmed test.

(3) *Completed Test*
When brilliant green lactose bile broth is used as a liquid confirmatory medium, in routine examinations, it is not necessary to carry out the completed test of Standard Methods. In the experiments, the results of which are reported here, the completed tests, as recommended in Standard Methods, were carried out for the sake of comparison.

Standard Methods

The procedure in Standard Methods was followed, but the brief outline below gives the variation of the method as used in our laboratory.

(1) *Presumptive Test*
Seven lactose broth fermentation tubes inoculated as follows: one 0.1 cc; one 1.0 cc. and five 10 cc. portions.

(2) *Confirmed Test*
All primary lactose fermentation tubes showing gas within 48 hours at 37°C. were transferred to brilliant green lactose bile 2% fermentation tubes.

(3) *Completed Test*
All brilliant green lactose bile fermentation tubes showing gas were streaked on EMB plates and typical (or atypical) colonies fished off into brilliant green lactose bile fermentation tubes, lactose fermentation tubes, and plain agar slants.

Water Samples

The majority of the samples of water were from raw, untreated supplies collected from all parts of Kansas by county health officers, engineers, nurses and sanitarians, and sent by mail to the laboratory. A few of the samples were from swimming pools and treated water supplies.

Results

The results obtained from the experiments comparing these two methods are given in Tables I and II.

The results in Table I give the total number of positive and negative tests for the coliform group by the two methods, when confirmed by the complete test or by the liquid confirmatory medium (B.G.L.B.). For a little clearer picture of the results Table II is presented.

Considering the results as given in Column A (Completed Test) it can be seen that the bottle method is more efficient in detecting coliforms than the Standard Method, as evidenced by the fact that the bottle method picked up 49 or 6.4% more waters showing coliforms than did the Standard Method. It is also noted that 16, or 2.1% of the waters were positive by the Standard Method and negative by the Bottle Method. However, the difference in favor of the Bottle Methed was 33 or 4.3%.

The results given in Column B (Liquid Confirmation Medium, B.G.L.B.) show that there are a few more positives than were obtained by the completed test. It has been observed that the slow lactose fermenters form gas in brilliant green lactose bile within the limits of the incubation period, whereas, no gas is formed in lactose broth. It is believed that brilliant green lactose bile is as satisfactory for confirming the coliforms as is the longer procedure used in the completed test.

Summary

Briefly the advantages of the Bottle Method are as follows:

1. More efficient and reliable.
2. Rapid.
3. Eliminates gas production in presumptive test.
4. No false positives.
5. Less chance for contamination.
6. Simplicity both in technic and equipment.
7. Economical.
   a. Less equipment, test tubes, pipettes, racks, etc.
   b. Less media.
   c. Decreases time in preparing media.
   d. Less dishwashing.
   e. More samples run per person (10 by bottle method to 1 by standard method).

References

[1]Standard Methods of Water Analysis, Eighth Edition, Am. Public Health Assoc. and Am. Water Works Assoc. (1936).
[2]Hall, I. C. and Ellefson, L. J., J. Bact., 3:328 (1918).
[3]Muer, T. C. and Harris, R. L. Jour. Am. Public Health Assoc., 10:874 (1920).
[4]Dunham, H. G., McCrady, M. H. and Jordan, H. E. Jour. A.W.W.A., 14:535 (1925).
[5]Jordan, H. E. Jour. A.W.W.A., 18:337 (1927).
[6]Salle, A. J., Jour. A.W.W.A., 21:71 (1929).
[7]Dominick, J. E. and Lauter, C. J. Jour. A.W.W.A., 21:1067 (1929).
[8]Salle, A. J., J. Bact., 20:381 (1930).
[9]Leahy, H. E. Jour. A.W.W.A., 22:1496 (1930).
[10]Ritter, C. Jour. A.W.W.A., 24:413 (1932).
[11]Stark, C. N. and England, C. W., J. Bact., 25:439 (1933).
[12]McCrady, Mac H. Jour. Am. Public Health Assoc., 33:10 (1943).
[13]Perry, C. A. and Hajna, A. A. Jour. Am. Public Health Assoc., 34:7 (1944).
[14]Weiss, J. E. and Hunter, Charles A. Jour. A.W.W.A., 31:707 (1939).

TABLE I
Comparison of the Standard Method and the Bottle Method Using Both the Completed Test and the Liquid Confirmatory Medium (BGLB)

Number of Water Samples	Standard Methods								Bottle Method							
	Completed Test				Liquid Confirmatory B.G.L.B.				Completed Test				Liquid Confirmatory B.G.L.B.			
	Positive		Negative		Positive		Negative		Positive		Negative		Positive		Negative	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
764	460	60.2	304	39.8	477	62.4	287	37.6	492	64.4	272	35.6	502	65.7	262	34.3

TABLE II

	A		B	
	Completed Test		Liquid Confirmatory B.G.L.B.	
Total number of water samples, 764	Number	%	Number	%
Number showing coliform by both methods	444	58.1	458	59.9
Number not showing coliforms by both methods	255	32.4	243	31.8
Number in disagreement	65	8.5	63	8.3
Standard methods + bottle method —	16	2.1	19	2.5
Standard methods — bottle method +	49	6.4	44	5.8
Difference in favor of bottle method	33	4.3	25	3.4

TO-DAY'S STANDARD GATE VALVES SUBJECT TO IMPROVEMENT

Some Faulty Design Features Disclosed in Study Lead to Recommended Improvements

By G. L. O'BRIEN
Designing Engineer
BUREAU OF WATER
BALTIMORE, MD.

THE Bureau of Water Supply of Baltimore, Maryland, has been experiencing trouble with its 6-inch and 8-inch gate valves. The valve body gate seat rings become so loose that they can be removed by hand. The writer was requested to make a study of the cause of this condition and to suggest a remedy for it.

Figure 1 shows the construction of a Baltimore City Standard valve of 1944. This standard is about the same as that offered by all the principal manufacturers. The writer examined one of these valves that had been installed in 1932 and removed from service recently, and found that he could remove one of the valve seat rings by lifting it out with his fingers; the other ring came out after striking it a few blows with a hammer. The original area of the iron threads had been eaten away but, as is common in electrolysis or galvanic corrosion, other threads of a larger diameter had re-formed. The bronze rings were in excellent condition.

The Author

This is a plain case of violating the established laws of galvanic corrosion. The writer has published an article on corrosion and cathodic protection in the July, 1942, issue of *Water Works and Sewerage*. Therein the mechanics of the corrosion of iron in water were discussed, and as the same principles apply in this case they will not be given here.

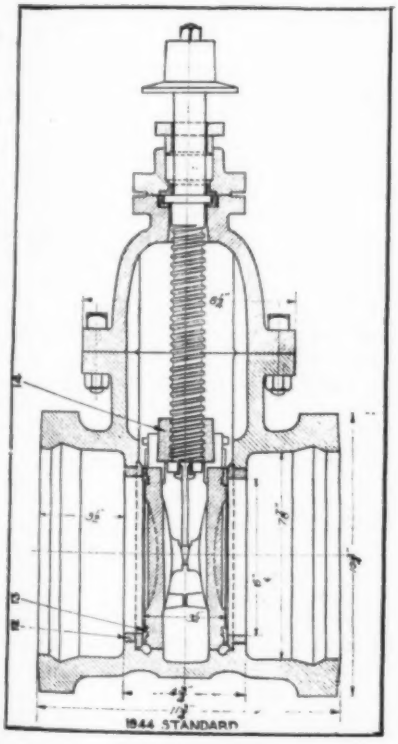


Fig. 1—Design of Gate Valve, Present Standard for Baltimore.
(Note Screwed-in Seat Rings)

Good Rules to Observe

The International Nickel Company, Inc. has published some excellent material on galvanic corrosion and has formulated certain laws to avoid trouble when dissimilar metals are placed together. The following laws have been taken from various publications with certain modifications by the writer.

Rule 1—"Select combinations of metals as close together as possible in the Galvanic series."

The Galvanic Series

Corroded End (Anodic or least noble)
Magnesium
Zinc
Aluminum 2 S
Cadmium
Aluminum 17 ST
Steel or Iron
Cast Iron
Chromium—Iron (active)
Ni-Resist
18-8 Stainless (active)
18-8-3 Stainless (active)
Lead-tin solders
Lead
Tin
Nickel (active)
Inconel (active)
Brasses
Copper
Bronzes
Copper-nickel alloys
Monel
Silver Solder
Nickel (passive)
Inconel (passive
Chromium-Iron (passive)
18-8 Stainless (passive)
18-8-3 Stainless (passive)
Silver
Graphite
Gold
Platinum
Protected End (cathodic or most noble)

The metals called noble are usually found in nature in that state. All

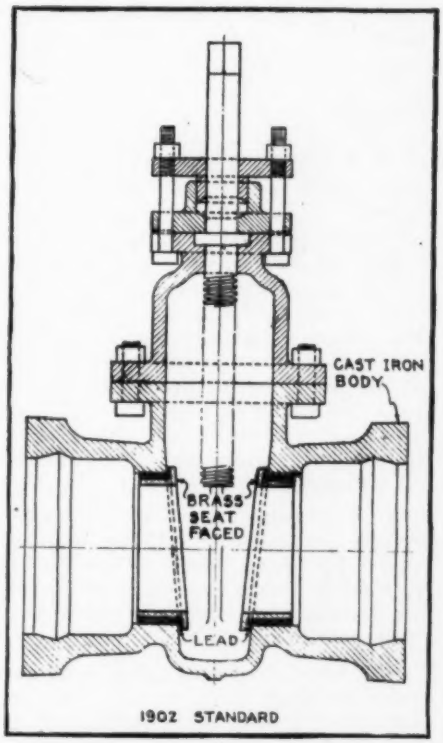


Fig. 2—Design of Earlier Gate Valve, Standard for Baltimore in 1902.
(Seat Rings Leaded in; Gate Rings Cast in.)

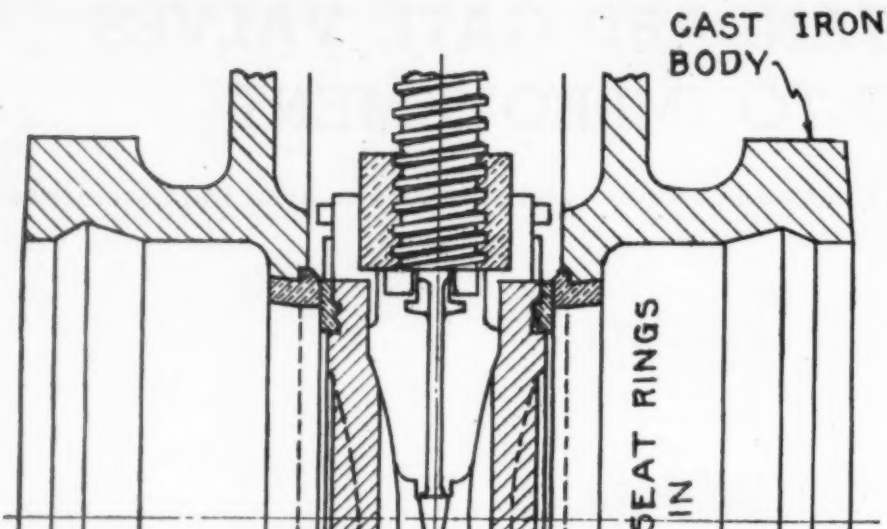


Fig. 3—Suggested Method of Installing Seat Rings by Rolling in to Minimize Galvanic Corrosion.

metals in their natural environment tend to go back to their native state. Gold is considered noble because under normal atmospheric conditions it will not corrode. Manufactured iron, on the other hand, attempts to revert to its original form in nature—the oxide—at first opportunity. Such reversion tendency is the basic principal of corrosion.

"When two unlike metals are connected to each other in any corrosive liquid (brine, for example), one metal is often attacked at a much faster rate than usual. The other metal either remains free from attack or is corroded at a considerably slower rate than usual. Because corrosion of this type is always associated with the generation of electrical current, it is described as 'galvanic corrosion.'"

"It is this galvanic effect that speeds up the corrosion beyond an ordinary rate. The metal which is corroded by this action is said to be 'anodic' and the metal which it more or less protects is termed 'cathodic.'"

"An excellent simple example of galvanic corrosion is found in the ordinary battery (dry cell) or a similar galvanic cell where a zinc anode (less noble) suffers accelerated corrosion while a copper cathode (more noble) is virtually unaffected. The battery, too, exemplifies generation of the electric current associated with corrosive galvanic action."

We see by examining galvanic series that iron and bronze are far apart in the series. Naturally corrosion should be expected and the question arises as to whether or not anything can be done to prevent it. If the following laws are observed, it can be almost completely prevented. Iron and bronze placed together in dry air will not corrode; therefore, if we can make a tight joint between the metals, no corrosion will take place except at the junction of these metals, which is usually small.

Rule 2—"Avoid combinations where the area of the less noble metal is relatively small."

"In any galvanic combination the relative areas of the two materials forming the couple have a very important bearing on the extent of corrosion. Under many conditions, the extent of galvanic effect will be very nearly proportional to the ratio of the area of the more noble metal to the area of the less noble metal. Thus, if a piece of steel having a surface area of two square inches is coupled to a piece of copper having a surface area of one hundred square inches, the extra corrosion due to the galvanic effect is roughly fifty times faster than it would be if the same piece of steel were coupled to a piece of copper having a surface area of two square inches. For this reason it is wise to avoid galvanic couples where the exposed area of the metal *lower* in the Galvanic series is much greater than that of the metal higher in the series. As a practical example, it would definitely be dangerous to use a steel rivet in a Monel metal plate but reasonably safe to use a Monel rivet in a steel plate."

In the case of the Baltimore City standard valve the area of the bronze thread is the same as the area of the cast iron thread. There is no possibility of preventing corrosion with conditions like this unless the ends of the threads are welded, brazed, rolled or cast in place.

Rule 3—"Insulate dissimilar metals whenever practical. If complete insulation cannot be achieved, anything, such as paint or plastic coating at the joints, to increase the resistances of the circuit will help."

If it were practical to place a plastic ring between the iron and bronze in the valves, no corrosion would take place.

"Many factors influence the intensity and distribution of galvanic corrosion. Some of these factors are more important than others from the standpoint of precautionary measures. One of the more important factors is the conductivity of the complete circuit. Since the voltages developed are very low, any permissible practice that increases the resistance or interrupts the circuit, minimizes or eliminates galvanic action. Partial or complete insulation of the metals at their points of contact or connection is very effective. Reduction of the amount of dissolved oxygen is another factor through which galvanic action can be retarded. During corrosion, hydrogen collects on the surface of the least attacked metal and in effect acts as an insulator in suppressing corrosive action on the more attacked surface. Since any action or material that removes the hydrogen film allows the corrosive action to continue and because oxygen tends to combine with the newly formed (nascent) hydrogen and remove it, as water, the presence of dissolved air (oxygen) should be avoided or limited as much as possible."

Rule 4—"Apply coatings with caution. For example, when painting, do not paint the less noble material without also coating the more noble, otherwise greatly accelerated attack may be concentrated at imperfections in the coating on the less noble metal. Keep such coatings in good repair."

The valve seat rings inspected showed great imperfections in lead dope coatings. Marked corrosion was evident at such places. It would be better to use no coating whatever than to use an imperfect one. A light neutral oil to

overcome thread friction would have been better.

Rule 5—"Avoid using threaded connections to join metals far apart in the galvanic series. Threads will probably deteriorate excessively. Brazed, rolled, cast or welded joints are better."

In our case the cast iron threads deteriorated to such a degree that the rings could be lifted out by hand. Furthermore, they are straight threads and not pipe threads so there is no possibility of getting an electrolyte-tight joint; unless the electrolyte can be kept out of this joint, corrosion prevention is impossible. As it does not seem possible to use a pipe thread in this case it would appear that some other solution is necessary.

The smoothness of the metal surface plays an important role in corrosion prevention. A polished surface will corrode at a lesser rate than a rough surface. Nickel steel (36 N 1), highly polished, is practically non-corrodible in potable water, yet if this surface is roughened with coarse emery paper a slightly adherent layer of rust will appear within a few days.

Railroad tracks on the main line are not nearly as corrodible as side tracks that are used only infrequently. Chute doors on a busy street, where people's shoes polish the surface, last much longer than those on a side street having little traffic. The polishing of the surface seems to break up the anodes and cathodes and make them ineffective, while a roughened surface increases the intensity of their fields; besides, it is an ideal place for corrosion bacteria. Corrosion products lodge in rough places and are apt to set up oxygen differential cells.

Rule 6—"Whenever possible install relatively small replacement sections of the less noble material at joints and increase the thickness of such material in these regions. For example, nipples of extra heavy wall should be used in piping, and replaceable pads should be attached to critical surfaces."

No comment will be made on Rule 6; it merely means that the area of the less noble material must be greater than the more noble.

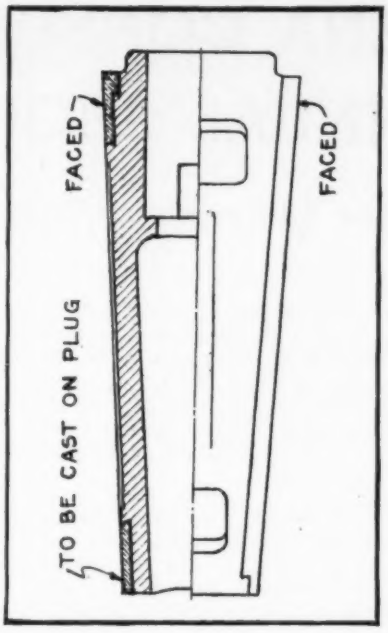


Fig. 4—Design of Gate of Baltimore Standard Valve of 1902 with Rings Cast in.

The above constitute the principal rules to avoid galvanic corrosion. Many more of lesser weight could be given but space does not permit. We can summarize by saying that threaded connections should be avoided unless sealed at both ends. Keep the abutting metals close together in the galvanic series. The presence of hydrogen ions and dissolved oxygen is the principal factor in under-water corrosion. The presence of free carbon dioxide in the water will increase the number of hydrogen ions. In general, the presence of mineral salts will speed galvanic effects. The application of chemical compounds that increase the alkaline properties of the water will reduce the acid tendencies due to carbon dioxide, and certain phosphate compounds seem to provide protective coatings on the metal surface in some cases.

A Corrective for Valve Corrosion

When it was known what was responsible for the trouble we were experiencing with the Baltimore valves, a method was suggested to the Water Engineer for rolling in the bronze rings as shown in Figure 3. This does away with all threads and provides protection from any slight corrosive film that may form on the flat surface, if some of the electrolyte should enter this joint. This is a great advantage in preventing further corrosion. To anyone not familiar with rolled sections it may seem that this would not be watertight, but steam boilers of low and high pressures are constructed with this method of sealing off their boiler tubes. It is believed that if the method of rolling in rings is adopted, as standard practice, it would fulfill the requirements as outlined above.

This practice of screwing in rings in gate valves seems to be new. The writer investigated previous standard designs of the Baltimore City Water Bureau prior to 1914 when the present standard was adopted, and found that these older valves did not contain such screwed parts. Figure 2 shows the Baltimore valve of 1902. It shows the valve body rings leaded in place while the rings in the gate were cast in—see Fig. 4. These valves gave excellent service but their production was abandoned due to a strike during World War I. These valves were made in our shop up until that time. The present Baltimore standard valve is the design of one of the leading water valve manufacturers.

Our next investigations were the "museum" valves on public view at Mt. Royal Maintenance Headquarters. These valves are much older than the standard 1902 valve. They seem to have been in the ground a long time, judging from the condition of the cast iron pitted surface on the ground side. The seats of these valves are as good as those on new valves; they seem to be pressed into the cast iron and then pinned. The pins can only be seen after a little sand-papering. The metal surface is about five times the area we are using today.

Correction Please!

Will all who have a copy of the 1945 Reference and Data Number (our June issue) please make the following correction in the Index to Advertisers which is found on the last page of the issue.

Builders-Providence Inc., should be credited with two pages in the Reference Section in addition to the p. 21 in the magazine section. These pages are R.-32 and R.-33.

Burgess-Manning Co., on the next line below are incorrectly credited with these two pages in addition to the p. 18 on which their ad appears—a case of misplaced type.

More Penna. Communities Ordered to Plan Sewage Treatment

A second list has been issued by the Penna. Dep't of Health supplementing the first list of some 200 communities, which have been notified by the Sanitary Water Board of that state to prepare plans for sewage treatment works. This second list contains the names of ninety-two boroughs, cities, or townships, all but two of which lie in Allegheny County.

This notification is part of an active and inclusive campaign of the State of Pennsylvania to remove municipal and industrial waste pollution from the streams of the state.

Latin American Sanitary Engineering

Sanitary Engineering developments in Latin America are bidding fair to keep pace with the Blueprint Now program in the United States. Late information indicates that a new sewerage and drainage system to cost $16,000,000 is scheduled for Mariano, Cuba. Studies are under way by an American engineering firm on a $4,000,000 project to supply water to Guayaquil, Ecuador from the Duale River about 12 miles above the city.

Already completed is the water filtration plant in San Jose, Costa Rica, and the sewage plant in Heredia, Costa Rica, a city of 12,000 population.

LOUISIANA CONFERENCE'S EIGHTH ANNUAL SHORT COURSE

Held at Louisiana State University in Baton Rouge, June 27-29

Secretary and Chairman

L. C. Eldridge, Sup't. Baton Rouge, La.

Geo. H. West, Sup't. Lake Charles, La.

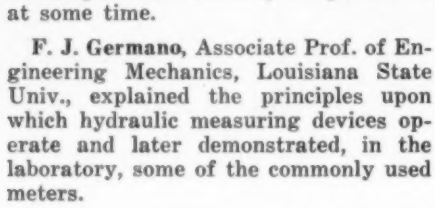
THE Eighth Annual Short Course for superintendents and operators of waterworks and sewage treatment plants was held at the Louisiana State University, Baton Rouge, June 27th, 28th and 29th. John H. O'Neill, Director, Div. of Public Health Eng., Louisiana State Board of Health, was the presiding officer. Greetings were extended by Dr. Fred C. Frey, Dean of the University, Professor M. B. Voorhies, of the College of Engineering and Dr. J. W. Brouillette, Director, General Extension Division, Louisiana State University.

Topics of interest to both water and sewage men were presented at a joint session during the first morning meeting. Thereafter, parallel sessions were held, in which topics of interest to each group were discussed, examinations for both groups being given on the last day of the course.

J. A. K. van Hassett, Regional Engineer, State Board of Health, stressed the importance of making laboratory tests of water and sewage treatment plants, in conjunction with the physical control of the plant, the effect on economy of operation and the value of these tests in cases where the safety of the plant effluent may be questioned at some time.

F. J. Germano, Associate Prof. of Engineering Mechanics, Louisiana State Univ., explained the principles upon which hydraulic measuring devices operate and later demonstrated, in the laboratory, some of the commonly used meters.

J. M. van Gilder, of Wallace and Tiernan Co., demonstrated the method of determining residual chlorine in chloramine treated water and in the presence of interfering substances. Particular attention was given to the sodium arsenite test.



Lecturers

A. A. Hirsch, Instr. in Water Purification, State Dep't. Education, New Orleans

Wm. A. Wintz, Instr. in Civil Engineering La. State Univ., Baton Rouge

J. A. K. van Hasselt, Regional Engineer, State Dep't. of Health, Baton Rouge

Director and Presiding Officer

Dr. J. W. Brouillette, Dir. Extens'n. Div. La. State Univ. Baton Rouge

John H. O'Neill Director Eng. Div. State Dep't. Health New Orleans

M. C. Schwartz, Assistant Prof. of Chemical Engineering, L. S. U., discussed principally cathodic control of corrosion of water tanks and indicated possibilities of the use of this method of control for water main corrosion.

The methods used by the Baton Rouge Waterworks in testing and repairing meters was discussed by **Joseph Anselmo,** Sup't. of Maintenance at Baton Rouge.

J. A. K. van Hasselt, Regional Engineer, State Dep't. of Health, cited many cases where contamination entered the water supply through sanitary defects at the source of supply, in the distribution system, and through water lines on consumers' premises. He referred to several outstanding cases where such contamination was responsible for water-borne disease epidemics.

D. L. Winters, Chemist, Gulf Public Service Co., New Iberia, gave his experiences in surface washing of filters and

Class in Part

S. S. Crawford, Sup't. of Sewerage Lake Charles, La.*

A Group of Attendants

J. J. Holtgreve, Mgr. Sewer Distr. Metairie, La.

(**Mr. Crawford serves on the Executive Committee of the Conference.*)

W. Homer Wisely, Exec. Sec'y. Sewage Works Federation Champaign, Ill.
and
Major R. M. Dixon, Chief, Water & Sewerage Sect. U. S. Engr's, 8th Service Command Dallas, Tex.
(Programmers.)

N. Lorio, Plant Operator, Marrero, La.
and
H. W. Blakeman, Superintendent Rayville, La.
(Members of Nominating Comm.)

made comparisons to a filter without this additional washing facility.

A. A. Hirsch, Instructor in Water Purification, Louisiana State Department of Education, reported on the itinerant plant schools held during the past year.

An interesting paper was presented by **C. M. Hunter,** L. S. U., on microorganisms which produce tastes and odors in water supplies.

Under the title "Water Supply in Pictures", **S. Steve Carnegie,** Public Health Engineer, State Dep't. of Health, showed series of slides and two motion picture films which were recently made by him at various Louisiana waterworks. A film showing development of large cracks in the sand bed and the formation of sand boils, and the proper procedure for washing filters, received much comment.

Prof. F. F. Pillet, Dep't. of Civil Engineering, L. S. U., in two separate discussions, reviewed the modern trends in water and sewage treatment. He presented data showing the number and types of plants built in the three year period from 1941 through 1943. These data were broken down into several population groups. He used these data to determine the relative popularity of the different types of plants and processes.

John L. Porter, Ass't. Director, Div. of Engineering, State Dep't. of Health, presented a very interesting paper on the impurities found in well waters and surface waters and their significance. He also outlined methods for their removal.

M. C. Schwartz, Ass't. Prof. of Chemical Engineering, L. S. U., demonstrated the use of sodium silicate as an aid to coagulation.

A detailed discussion on theoretical principles and methods of operation of Imhoff tanks and trickling filters was given by **W. A. Wintz, Jr.,** Instructor in Hydraulic Engineering and Engineering Mechanics, L. S. U.

Odor control and the control of filter flies at sewage treatment plants was reviewed by **A. A. Hirsch,** Instructor in Sewage Treatment, Louisiana State Dep't. of Education.

Major R. F. Dixon, C. E. Utilities Branch, Eighth Service Command, discussed the problems encountered in water supply and sewage disposal at army camps and stressed the importance of keeping proper records, and plant cleanliness.

Publications Committee Chm'n.

M. C. Schwartz, Ass't Prof. Chem. Eng. and Research Associate in Water Technology, Louisiana State Univ., Baton Rouge

L. J. Voorhies, Consulting Engineer, Baton Rouge, in his talk on "Construction and Maintenance of Sewers", discussed in detail the effect of width of trench and loading on sewer pipes. Lack of attention to this item in constructing sewers is a frequent cause of breakage of sewer pipes. Mr. Voorhies gave an interesting talk on a variety of items from his long and varied experience in sewer work.

S. S. Crawford, Sup't. of Sewerage, Lake Charles, gave his experiences with the bulking of sludge and corrective methods employed at this plant.

Louis Cusachs, Director, Div. of Research and Statistics, Louisiana Dep't. of Wildlife and Fisheries, presented a paper on dissolved oxygen in streams and its use as an index in pollution. He later gave laboratory demonstration of B.O.D. tests.

W. L. Owen, Assoc. Prof. of Bacteriology, L. S. U., traced sewage disposal from Deuteronomy and explained that bacteria are a necessity in decomposition of sewage. He pointed out that modern methods only provide better environment for the bacteria to work.

Conference Officers

During the Short Course the Louisiana Conf. on Water Supply and Sewerage held its Annual Dinner and Business Meeting at which the following were chosen as officers for the ensuing year.

Chairman—(re-elected)
George H. West, Supervisor, Water and Sewage Treatment, Lake Charles, La.

Vice-Chairman
Stark Davis, Gramercy, La.

Sec'y-Treas.—(re-elected)
L. C. Eldridge, Eng'r. & Sup't. Baton Rouge Water Co., Baton Rouge, La.

S. W. Hazlip, Chemist, Houma, La., was elected to the Executive Committee.

Acknowledgments

This report was supplied by S. Steve Carnegie, of the Engineering Div. of the La. State Dep't. of Health.

The pictures accompanying the report were all taken by Wm. E. ("Bill") Pebworth, District Manager, Hersey Meter Co., Dallas, Texas.

Our appreciation to both.

S. W. Hazlip Chemist Houma, La. (Member Exec. Comm.)

R. M. Dunn Supervisor Water Distr. Lake Charles, La.

Geo. M. Gerlach Gen'l. Sup't. Gulf Service Co., New Iberia, La.

Jos. Cefalu Supt. Water & Light Morgan City, La.

More Real "Blueprint Now" Action!

The seeds of Blueprint Now are bearing fruit. Latest information available indicates that planning of new, and improvement of old water and sewage systems is proceeding at more than three times the pre-war normal rate, according to Dr. Abel Wolman, Chairman of the Committee on Water and Sewage Works Development, in his report to the annual meeting of the officers of AWWA held in New York, on June 29, in the absence of the National Convention.

According to the report of the ASCE Committee on Post-war Construction, on July 1, 1945, the total water works planning was $518,358,000, and the total sewage works planning was $1,055,742,000. These amounts are roughly 6.4 and 13 per cent respectively of the total public works planning of $8,148,502,000. Over a twenty year period before the war, Chairman Wolman said these percentages were respectively 2.5 and 4 per cent.

Aiding in the development of this planning in some instances is the allotment of funds by state planning commissions to help communities with the preparation of plans. The Federal government likewise has been helping. Congress has appropriated $17,500,000 for advances, through the FWA Bureau of Community Facilities (War Mobilization and Reconversion Act of 1944) to communities and states for the financing of the preparation of post-war plans. Advances for this purpose are to be repaid when funds become available to the applicant to construct the specific public works for which the advance was made.

As of July 1, 162 applications had been made for these allotments, and to July 28, a number of grants have been made. These grants for water and sewage facilities are shown in the accompanying table.

In addition to the allotments for planning, the Federal government has also been allotting funds for actual construction of projects, through the Lanham Act grants. Among the recipients of these funds recently have been Harrisburg, Ill., a grant of $244,350 for the construction of an impounding basin with a capacity of 1,500 mil. gal. The larger part of this reservoir will lie within the boundaries of the Shawnee National Forest. The city of Litchfield, Ill., will receive $25,000 to cover the cost of constructing a small dam to impound 30 mil. gal. as standby source.

Burbank, Cal., will increase its water system at an estimated cost of $697,628, about half of which will be paid for by the Lanham Act funds and the other half by the FWA Bureau of Community Facilities funds. King County Water District in the state of Washington will receive $45,000 for a well and pipe line, and Prosser, Wash., has been granted $30,015 to meet half the estimated cost of a sewage treatment plant.

Other Lanham Act funds recently allotted include $46,000 for additional water mains at Ogden, Utah, $105,000 to Daytona Beach, Fla., toward the $262,500 sewage treatment plant; $42,000 to the town of Fallbrook, Calif., for sewers; and $60,392 to be matched by an equal amount by Ft. Wayne, Ind., for sewers. Ft. Wayne has already completed a $167,916 sewer project, half of which was financed by Lanham Act funds.

Communities receiving Lanham Act funds have been those where the additional construction was necessitated by wartime developments.

ALLOTMENTS FOR PLAN PREPARATION

(Advances by FWA Bureau of Community Facilities)

Community and Facilities	Amount of Advance	Project Cost
Auburn, Ala. (Sewage)	$ 7,141	$ 199,242
Bentonville, Ark. (Sewage)	4,500	101,200
" " (Water)	6,250	134,200
Mountain Home, Ark. (Sewage)	3,200	105,000
" " " (Water)	30,000	1,412,000
Alameda, Calif. (Sewage)	11,000	300,000
" " (Water)	6,000	160,000
Ansonia, Conn. (Sewage)	6,350	243,350
New Haven, Conn. (Sewage)	26,000	4,000,000
District of Columbia (Sewage)	24,000	550,000
DeLand, Fla. (Sewage)	15,450	418,000
" " (Water)	4,225	91,000
Macclenny, Fla. (Sewage)	3,500	64,494
New Smyrna Beach, Fla. (Sewage)	11,500	290,000
Cobb Co., Ga. (Water)	1,596	57,242
Hampton, Ga. (Water)	3,095	62,557
Hillsboro, Ill. (Water)	700	26,700
Monroe, Iowa (Sewage)	1,100	75,220
Wetmore, Kan. (Water)	1,488	46,436
Alexandria, La. (Storm) (Sewage)	9,000	296,800
Colfax, La. (Water)	1,640	44,280
Eunice, La. (Drainage) (Sewage)	4,160	114,168
Gonzales, La. (Sewage)	2,200	61,500
Jackson, La. (Sewage)	2,400	66,600
Jonesville, La. (Sewage)	2,640	70,620
Mansura, La. (Sewage)	1,784	49,476
Monroe, La. (Drainage)	22,140	812,900
Pineville, La. (Storm) (Sewage)	5,160	138,040
Clinton, Me. (Water)	3,000	110,820
Northeast, Md. (Sewage)	4,250	100,000
" " (Water)	4,250	100,000
North Brookfield, Mass. (Sewage)	1,778	47,817
Monticello, Minn. (Sewage)	2,578	54,745
" (Water)	2,005	45,355
Bay Springs, Miss. (Sewage)	3,904	101,700
Greenville, Miss. (Sewage)	15,000	326,500
Town of Tishomingo, Miss. (Water)	2,060	47,000
Cabool, Mo. (Water)	880	21,000
" " (Sewage)	1,760	52,500
La Due, Mo. (Drainage)	6,000	182,000
Lillbourne, Mo. (Water)	3,300	66,075
New London, Mo. (Sewage)	2,850	90,000
" " " (Water)	3,150	100,000
Steele, Mo. (Water)	1,450	47,600
" " (Sewage)	840	24,700
Ada, Okla. (Sewage)	2,200	75,000
" " (Water)	6,792	240,000
Collinsville, Okla. (Sewage)	2,625	54,600
Enid, Okla. (Water)	14,801	648,662
McAlester, Okla. (Drainage) (Sewage)	9,200	367,892
Seiling, Okla. (Water)	2,900	53,000
Talihina, Okla. (Water)	450	18,560
Town of Minco, Okla. (Water)	2,770	45,000
Vinita, Okla. (Water)	6,540	364,500
Andrews Co., Tex. (Water)	2,955	140,000
Galveston County, Texas (Sewage)	4,427	125,000
" " " (Water)	4,427	125,000
Hamilton, Texas. (Sewage)	1,227	28,000
" " (Water)	1,950	45,000
McAllen, Texas (Sewage)	4,750	200,000
Moulton, Texas (Sewage)	1,320	26,500
" " (Water)	869	17,800
Ft. Worth, Texas (Sewage)	2,250	75,000
" " " (Water)	1,800	60,000
Robstown, Tex. (Sewage)	2,000	54,000
Smithville, Texas (Sewage)	3,800	110,000
Waco, Texas (Sewage)	5,154	133,450
Weatherford, Tex. (Sewage)	1,460	32,500
" " (Storm) (Sewage)	2,133	47,500
Woodville, Texas (Sewage)	1,750	55,000
Charlottesville, Va. (Sewage)	8,000	260,000
Portsmouth, Va. (Sewage)	7,600	300,000
Waynesboro, Va. (Sewage)	15,750	458,700
Clarksburg, W. Va. (Sewage)	32,000	1,000,000
Parkersburg, W. Va. (Sewage)	3,000	115,300
Richwood, W. Va. (Sewage)	600	11,600

THE AUTOXIDATION PROCESS

A Method of Producing Ferrous Sulphate, Ferric Sulphate or Sulphuric Acid

By HARMON E. KEYES
Consulting Chemical and Metallurgical Engineer
PHOENIX, ARIZONA

and

DARIO TRAVAINI
Superintendent
SEWAGE TREATMENT WORKS
PHOENIX, ARIZONA

THE Phoenix, Arizona activated sludge separate sludge digestion sewage treatment plant was placed in service in March, 1932. The City Commissioners and citizens sighed with relief as they knew that threatened law suits and the objectionable pollution characteristics of the dry Salt River bed below the city would be eliminated. The plant was of 12 mgd. capacity (based on clarifier characteristics at 1,680 gal./sq. ft. overflow rate and 1 hr. retention), and everyone was confident of many years of service before expansion problems would confront the city.

The Authors
Dario Travaini Harmon E. Keyes

The steady influx of settlers into the fertile Salt River Valley, coupled with expanding industries and thousands of vacationists coming to Phoenix from all parts of the country, caused the sewage treatment plant to approach its capacity at an alarming rate only five years after being placed in service. To make matters worse, in 1937 the city was planning a large annexation program which would mean additional flow. The city did not want to spend great sums in complete expansion of a plant only 5 years old. Ways and means were thought of to afford a solution of the sewage treatment problem for a reasonable future by proposing to increase the capacity to 16 mgd. with the least expenditure.

At the sewage treatment plant experiments on flocculation with and without chemicals were conducted. The average per cent removal of suspended solids and B.O.D. in 258 sets of experiments, conducted during a 7-month period, are shown in Table I. Chemicals used were those readily available in Phoenix, viz. alum and ferric salts. No pH adjustment of the sewage was undertaken. Ferric sulphate was used in the experiments because this iron salt would entail the least difficulties in Phoenix. Commercial ferric sulphate, or the materials for the production of chlorinated copperas could be obtained reasonably and without transportation or handling difficulties.

In comparing chemicals, alum is calculated as total weight of commercial product, whereas ferric sulphate is based entirely on the iron (Fe) content. This relationship is maintained throughout in cost analysis.

Results of the experiments were gratifying, especially so with ferric iron, and the city officials felt that if experimental results could be approximated at plant scale, 16 mgd. could be successfully treated at the 12 mgd. plant.

The problem then reverted to finding the cheapest ferric salt to be used when needed to augment plain flocculation, and to make all possible savings when operating at plant level.

The autoxidation process of producing iron salts was investigated along with others. As developed at the Phoenix Sewage Treatment Plant, this process under 1939 Phoenix conditions, showed that ferric sulphate could be produced at a cost of 2.5 cents per pound of ferric iron. In addition, ferrous sulphate or dilute sulphuric acid could be manufactured if desired. Since a considerable number of plants, both water purification and sewage treatment, use one or all of these chemicals, a complete description of the development and operation of the autoxidation process appears appropriate.

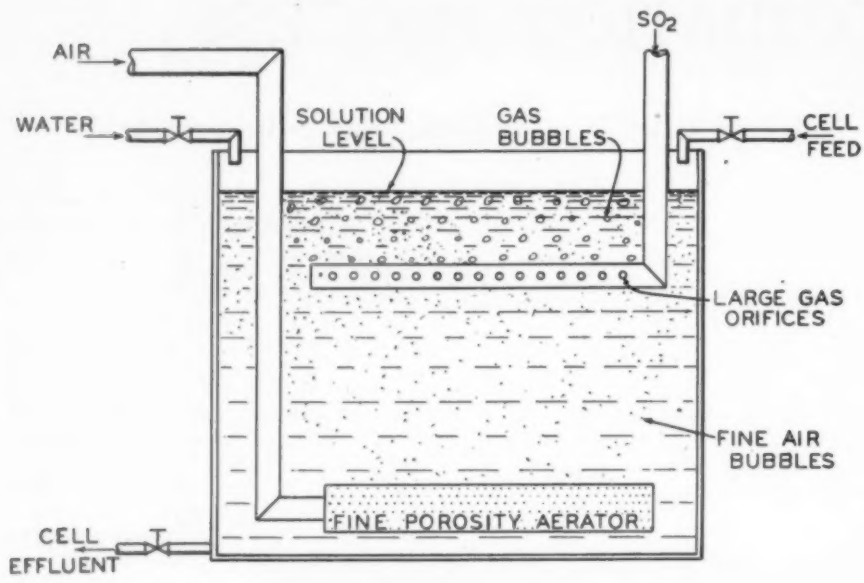
TABLE NO. I

Comparison of Sedimentation Characteristics Using Plain Flocculation and Flocculation with Chemicals

(Per Cent Removals Based on 30 Minute Flocculation Period, Followed by 1 hr. Settling Period. No pH Control)

			pH	Suspended Solids ppm.	B.O.D. ppm.
Average Analysis of Raw Sewage Used in Tests			8.1	208	191
	Plain Flocculation No Chemicals	Dosage 0.3 gr. per gal. Alum as $Al_2(SO_4)_3 18H_2O$	Dosage 0.3 gr. per gal. Ferric Sulphate as Fe^{+++}	Dosage 0.5 gr. per gal. Alum as $Al_2(SO_4)_3 18H_2O$	Dosage 0.5 gr. per gal. Ferric Sulphate as Fe^{+++}
Suspended Solids— % Removal	86.9	89.2	94.2	88.2	95.5
B.O.D. — % Removal	47.8	50.9	54.0	56.9	61.8

NOTE: 1 grain/gal. Fe^{+++} = 3.57 gr./gal. $Fe_2(SO_4)_3$.



Conversion Cell

History and Description of Autoxidation Process

The "autoxidation process" has been applied to a limited extent in copper ore leaching. It is based on the simultaneous oxidation of sulphur dioxide and ferrous sulphate by finely divided air, according to the reaction.

$$2\ FeSO_4 + SO_2 + O_2 = Fe_2\ (SO_4)_3$$

This was described by Emmons[1] in patent filed March 29, 1894. It was also stated by Clark[2] in British patent filed March 9, 1888, that dilute acid could be produced by the catalytic action of dissolved metal salts, such as iron or manganese, according to the reaction

$$2\ SO_2 + O_2 + H_2O = 2\ H_2SO_4$$

Developments by the U. S. Bureau of Mines during the period 1922-30[3] featured this basic method for production of acid-ferric sulphate solutions in leaching mixed oxide-sulphide copper ores of the Southwest.

These investigations proposed adding finely divided air and SO_2 into a solution containing dissolved ferrous sulphate. The iron was first largely oxidized to ferric sulphate, as above stated, and as the SO_2 air addition was continued, acid was formed to a maximum of about 10 per cent. Fine subdivision of air was a requisite to preferential oxidation.

As there is a considerable time factor involved in the reaction, relatively large volumes of solution under treatment are required, and the rate of SO_2 addition should not exceed a certain limiting value.

Large scale experiments were conducted at copper mines, using a novel engineering design[4] to facilitate aeration and handling dirty SO_2 gas from pyrite roasting. The same basic method of SO_2 conversion was also tested in treating boiler stack gases.[5]

Up to this point, general application of this process to industry was limited by the following: difficulty in contacting solution and SO_2 gas; overlapping of oxidation and acid forming phases of reaction, causing ratios of ferric iron and acid not adaptable to specific uses; limitation to very dilute solution; incomplete conversion of SO_2, causing air pollution.

Because of the potentialities of this process in cheap iron salt production, an investigation was conducted by the City of Phoenix to ascertain the feasibility of thus producing cheap iron salts at the sewage treatment plant. A certain amount of new development was contemplated.

The prerequisites of the process, as applied to sewage treatment, were, (1) production of either ferric or ferrous sulphate solution at concentrations up to 50 g. Fe per liter, with free acid held at any desired concentration; (2) practically complete conversion of SO_2 gas to sulphate so that no objectionable odor or hazard to vegetation would exist; (3) simplified plant operation to minimize supervision and laboratory control; (4) low cost of installation and maintenance; (5) reasonably fool-proof mechanical operation.

Phoenix Experimental Developments

Experimental work conducted at the Phoenix Sewage Treatment plant in 1938 demonstrated that the above prerequisites could be met by employing a sulphur dioxide conversion cell of improved design. Briefly, this cell is composed of an aerator comprised of "Aloxite" alundum tubes, of No. 5 permeability, in the bottom of a tank and an SO_2 distributor consisting of perforated lead pipes, in the same tank, at a submergence of 6 inches to 3 feet, depending on the pressure characteristics desired in the SO_2 system.

This system permits adding the SO_2 at a pressure obtainable with centrifugal-type blowers or by use of a pressure sulphur burner. Development of the new type SO_2 conversion cell was necessitated by the inability of former types to preferentially oxidize iron, or to absorb SO_2 sufficiently to meet air sanitation requirements around a municipal plant, or to operate at a sufficiently low pressure of SO_2 to enable its addition to the conversion cell by standard gas handling equipment.

A pilot plant was accordingly constructed, using compressed SO_2 gas mixed with air to give 10 per cent SO_2. After development of this successful conversion cell, 24 test runs were made to obtain quantitative data. The solution column was approximately 4 ft. 6 in. deep and the aerator pressure averaged 3.0 lb. The pressure on the SO_2 line outside the cell, varied from 0.56 to 2.0 lb. depending on submergence. The SO_2 distributor consisted of a 2-in lead pipe perforated with ⅛ or 1/16-in. holes.

Batch operation rather than continuous flow was found logical, as it provided for maximum control of the end-point of the reaction. It is often desirable to stop the reaction upon completion of oxidation and before appreciable free acid is formed. Test data indicated that desired inhibition of acid production could be secured by proper control of the cell operation. The cell feed was substantially neutral ferrous sulphate, obtained by reducing former batches of ferric sulphate produced in the cell.

Typical runs of the Phoenix Pilot Plant are summarized in Table II.

Variation in oxidation rate with increasing iron concentration is shown in Tests F22, F25 and F26.

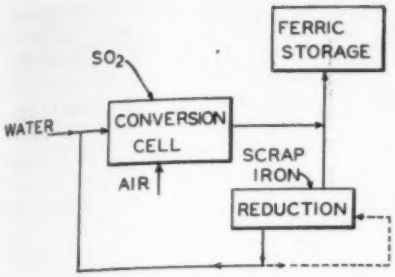
The results in Table II indicate that iron solutions of more than 50 g. per liter may be successfully oxidized, but at a slight decrease in operating efficiency.

TABLE II

Pilot Plant Runs

Test	G. per liter Fe Oxidized	G. per liter Acid Produced	Oxid. Rate Fe g./?/Hr.	% Conversion SO_2	% Oxidation Fe	Aeration Rate*
F14	32.3	4.68	10.35	99.3	97.4	0.463
F15	28.0	2.98	9.33	99.4	92.2	0.558
F20	30.9	1.72	9.90	99.6	99.6	0.724
F21	32.35	1.59	9.45	99.7	99.6	0.739
F22	28.45	1.71	9.48	99.9	96.7	0.587
Av.	30.4	2.53	9.71	99.58	97.1	0.614
F22	28.45	1.71	9.48	99.9	96.7	0.587
F25	44.1	2.52	8.02	99.3	96.8	0.922
F26	51.6	3.47	6.11	97.5	97.4	0.725

*Aeration rate as cubic feet free air per minute to aerators, per cubic foot solution volume.



Flow Diagram—I
Ferric Sulphate Production

The above tests showed a temperature balance of 40°-60° C., maintained by the exothermic nature of the reaction. This is a very satisfactory condition, as efficiency increases with temperature up to about 60° or 70° C.

Extreme fineness of air subdivision was a vital factor in producing effective results. Using "Aloxite" brand diffuser tubes 4¼-in. O.D. by 24-in. long, at aeration rates contemplated in practice, pressure drop tests showed about 0.6 lb. greater pressure for the No. 5 tubes than for the No. 24 tubes of 40 permeability.

Table III shows a comparison of iron oxidation rates, aeration rates and SO_2 conversion efficiencies, under average pilot plant conditions and using the following types of air diffusers: perforated lead pipe with cascade type SO_2 absorber, Aloxite 23.8 diffuser with perforated lead pipe SO_2 distributor, and Aloxite No. 5 diffuser with perforated lead pipe SO_2 distributor. Dilute sulphur dioxide in each case was added through a perforated lead pipe distributor.

It is noted in Table III that changing the permeability of the diffuser from 23.8 to 5 increased the iron oxidation rate from 2.68 to 9.68 g. per liter per hr., lowered the required aeration air by one-half and increased the SO_2 conversion efficiency by 4.5 per cent. This was accomplished at an increase in aerator pressure of only 0.77 lb. per sq. in.

TABLE III

Comparison of Types of Air Diffusers

Rate Fe Oxid. g./L/Hr.	Air Press. Lb./Sq. In.	Aeration Rate*	% SO_2 Converted	Aerator Type
1.85	2.44	1.82	85.3	Perforated Lead Pipe
2.68	2.25	1.43	95.1	Aloxite No. 23.8
9.68	3.02	0.73	99.6	Aloxite No. 5

*Aeration rate expressed as cu. ft. air per minute per cu. ft. solution volume.

The Phoenix Process

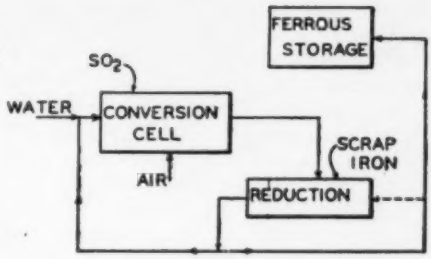
The Phoenix process, as here described, involves (1) oxidation of ferrous sulphate by a sulphur dioxide conversion cell of improved design, using finely divided air; (2) recirculating a portion of this solution over scrap iron to reduce the ferric back to ferrous iron and increase the total iron content; (3) making up the reduced solution with water to original volume and returning to the oxidation cell.

Calculations show that for every pound of iron removed for use as ferric, 3 pounds must be oxidized in the cell, whereas if ferrous sulphate is removed for use to the sewage treatment system the amount of iron oxidized is twice that removed to sewage. These developments have demonstrated substantially complete iron oxidation without formation of appreciable free acid.

In the contemplated flow sheet, any desired portion of the ferric sulphate solution could be reduced to ferrous sulphate by contact with scrap iron. In the pilot plant work, all of the solution oxidized in the SO_2 cell was successfully treated in the reduction division. As compared to oxidation, the reduction stage offered no serious problem. In general, a two hour contact with metallic iron sufficed to substantially complete reduction as well as to neutralize acid. It is noteworthy that the ferric iron reduction proceeds much more rapidly than the acid neutralization. This is shown by the data in Table IV—a and b.

Commercial Type Iron Sulphate Plant

During June, 1939, the City of Phoenix erected and put into regular operation a larger batch unit to furnish iron sulphate for sewage treatment. To date this plant has been employed to supply ferrous sulphate for odor control in the activated sludge plant. The entire batch of ferric sulphate contacts scrap iron, one-half of the quantity of iron originally oxidized then being advanced to storage. Since its initial operation this plant has been supplying all the iron sulphate required for control of H_2S odors in the primary clarifier. Simplicity of operation is enhanced by use of a pressure sulphur burner, having a capacity of 25 to 40 lb. sulphur per hour. Iron is oxidized at a rate of 4 g. per liter per hour, the oxidation rate being limited by the sulphur burner capacity. Air at 6 lb. pressure from the sewage aeration system supplies both the sulphur burner and the oxidizing cell.



Flow Diagram—II
Ferrous Sulphate Production

TABLE IV

Solution Reduction by Scrap Iron

A—Solution Before Reduction—Gram per Liter

Ferrous Iron	Ferric Iron	Total Iron	Sulphuric Acid
1.4	52.9	54.3	4.02

B—Solution After Reduction—Grams per Liter

Contact	Ferrous Iron	Ferric Iron	Total Iron	Sulphuric Acid
5 min. ..	46.6	20.3	66.9	2.67
15 min. ..	74.0	2.5	76.5	1.88
30 min. ..	77.3	0.0	77.3	0.75
1 hr.	....	....	....	0.28
2 hr.	....	....	....	0.17
3 hr.	....	....	....	0.10
6 hr.	....	....	....	0.05

The above data show that whereas 52.9 g. per liter of ferric iron was reduced in 30 minutes, it required 6 hrs. to neutralize 4.0 g./l. of free acid, using ordinary scrap iron.

The cell consists of a Douglas fir wood tank 9 ft. 6 in. inside measurement, by 5½ ft. deep, employing a solution column of 4½ ft. giving a net solution volume of 2,270 gallons after deducting fixtures. The aerators consist of 24 No. 5 permeability, Aloxite alundum tubes, 4¼-in. O.D. x 24 in. long. These are connected in pairs end to end by steel tie rods. Air is supplied from a header to each pair of tubes thru flexible rubber hose connected to lead "T" connections at the tubes. The nuts and washers securing the tie rods are covered over with lead. After 5½ years operation, the only significant repairs have been replacements of rubber hose used for lead pipe connectors and for pinch clamp valves.

Sulphur dioxide from the pressure burner is conducted to the cell by a 4-in. standard steel pipe. It is distributed by a header to 3 sections of 2-in. lead pipe drilled with 3/16-in. holes ½ in. apart, having a submergence of approximately 3 ft. In a typical operation the SO_2 pressure is practically equal to the hydrostatic head on the absorber. The aerator pressure ranges from 3 to 4 lb.

The reducing tank of Douglas fir wood also, is 14 ft. in diameter with 4 ft. staves. Perforated lead pipes underneath a perforated wood false bottom supply air for agitating the solution contacting the scrap iron. Miscellaneous scrap iron from the city dump is used as the source of iron. The reducing tank holds one complete batch of ferric sulphate from the oxidizing

cell. A one hp. 1½-in. discharge rubber lined "Ace" acid proof pump returns ferrous sulphate solution from the scrap iron reducing tank to the conversion cell, or to any storage tank.

The burner capable of operating under pressure, insuring mechanical simplicity and continuity of operation, is a development of the Freeport Sulphur Co. This burner, here illustrated, has been previously described in the technical literature[6].

The burning takes place in a pan. Molten sulphur is added by an automatic feeder so that a constant level is maintained in the combustion chamber. Solid sulphur is added periodically to the steam-jacketed hopper in which it is melted. The burning rate is controlled by the amount of air supplied to the burner and operates without attention for several hours. Steam pressure is generated in the burner jacket by electric heaters prior to starting the burner. After the burner is in operation the heat from the combustion of the sulphur maintains the steam pressure with occasional aid from the electric heaters. The operating principles of this burner are shown diagrammatically in Fig. 1.

The above plant has consistently shown less free acid at the end of the oxidation period than was the case with the pilot plant operation. This improved efficiency appears to be due to better circulation in the larger oxidizing cell.

Data covering the operation from July 1, 1939 to Jan. 1, 1945, are given in Table V. Averages are shown for each year of operation, and for the entire period covered. Typical individual runs, over the entire period, are given to illustrate acid inhibition up to the point of substantially complete oxidation. When certain amounts of free acid are desired, it is only necessary to continue the reaction after completion of iron oxidation, as shown in the run of 10-28-40 in which acid of 10.1 grams per liter was produced.

The air flows are regulated by use of standard orifice flow meters in both the sulphur burner intake and aerator lines. Inasmuch as these flows did not vary materially, when once established, the averages for the total operating period are shown with the data.

Analytical data are incomplete for the year 1944. After standardizing the plant operation, close laboratory control was not essential. It was found that the plant could be successfully operated on an empirical basis.

The use of this conversion apparatus for producing acid up to 10 or 15 per cent was investigated as a logical means of producing cheap acid. This embraced a wide range of iron concentrations. Table VI shows a summary of these runs, starting with neutral ferrous sulphate solution.

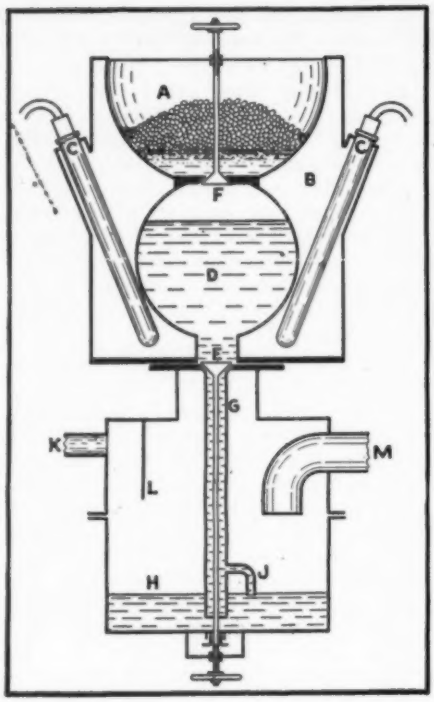


Diagram of Sulphur Burner

Solid sulphur is added to the hopper A where it is melted by the heat supplied in steam jacket B. If a source of steam is not readily available, electric heating elements C are provided. Whenever it is desired to fill the feeder D, the valve E between the burner and feeder is closed and the valve F between the feeder and hopper is opened. Molten sulphur runs down from the hopper filling the feeder. Then the valve positions are reversed; valve F is closed and valve E is opened. Sulphur runs down the feed pipe G until the liquid sulphur level H in the burner gets up to the end of small pipe J. At this point the flow of sulphur stops, since the end of the feed pipe is sealed and no more sulphur can run into the burner until the level drops enough to permit gas to bubble up the feed pipe and displace sulphur in the feeder until the end of the pipe J is again sealed with liquid sulphur.

TABLE VI

Acid Production

Solution, g. per Liter, End of Run			
Total Iron	Ferrous Iron	Ferric Iron	H_2SO_4
26.1	0.44	25.7	93.7
14.4	0.05	14.3	150.3
2.1	nil	2.1	110

The above acid runs illustrate possibilities in production of cheap dilute acid for industrial and municipal operations.

During the 5½ year period of oxidation runs, no appreciable concentration of sulphur dioxide existed in the effluent gas from the conversion plant. This is attested by the lack of attack on vegetation adjacent to this plant, as is indicated by the green foliage shown in the photographs taken during the operating period. The exhaust gases are discharged directly from the conversion cell to the atmosphere, no stack being used. Vegetation ten feet from the cell has not been damaged by normal oxidation runs.

During last acid run (Table VI) the effluent SO_2, resulting from the mixed aeration and sulphur burner air, averaged 0.045 per cent. On this run the SO_2 fed to the cell averaged 3.94 per cent and the acid formation rate was 4.1 grams acid per liter per hour. The duration of the batch run was 25.3 hours.

The only operating difficulty encountered to date was tendency to clogging of the aerator tubes, and this was overcome by short periods of discontinuing

TABLE V

Operating Data, Phoenix Plant—Average of Batch Runs

Period	Soln. Temp. °F.		Ferrous Iron g./liter		% Conversion to Ferric Iron	H_2SO_4 g./liter		% SO_2 to Cell	Lb. Sulphur Burned	Aerator Pressure In. Hg.	Operating Time Hr.	Air cfm. Aerator	No. Total Runs
	Start	Finish	Start	Finish		Start	Finish						
1939	76.3	108.5	30.5	2.38	92.2	0.22	0.28	2.78	148	....	....	.....	..
1940	70.7	113.5	29.4	0.55	98.1	0.23	4.49	3.33	192.5	6.68	7.56	141.8	65
1941	70.1	114.0	28.9	0.60	97.9	0.49	1.97	4.30	196.5	7.45	8.04	154.3	66
1942	72.4	112.7	26.3	1.33	94.9	0.44	1.61	3.71	151.0	7.18	6.60	159.3	65
1943	71.3	111.7	26.1	1.32	94.9	0.66	2.64	3.30	152.8	8.56	6.59	145.5	57
1944	67.6	102.5	25.2	....	....	....	....	....	141.5	9.60	6.50	199.5	62
Gen. Av.	71.4	110.6	27.8	1.23	95.5	0.41	2.20	3.49	163.6	7.9	7.06*	160.0*	63*
												*4 Yr. Averages	
Date of Individual Runs													
10-28-40	70	109	19.3	0.1	99.5	0.25	10.1	3.42	160	6.3	....	.....	..
4- 1-40	63	104	36.1	0.1	99.7	nil	1.6	2.79	280	7.8	....	.....	..
4-28-41	69	113	28.7	0.4	98.6	0.75	0.9	4.61	160	6.7	....	.....	..
2- 3-41	58	108	30.4	0.3	99.0	0.3	0.3	3.91	240	10	....	.....	..
5- 5-41	72	117	28.4	0.1	99.6	0.65	1.5	4.74	200	6.0	....	.....	..
8- 8-41	85	121	23.8	0.1	99.5	0.6	1.1	4.23	140	6.5	....	.....	..
12- 2-42	66	100	21.0	0.2	99.0	0.1	1.3	2.8	140	8.3	....	.....	..
3-16-43	76	114	29.8	0.1	99.6	0.7	1.8	3.47	120	8.3	....	.....	..

General View of the Plant

Sulphur Burner Building to the Left. Reduction Tank, Foreground. Aeration Tank in Rear with Storage Tanks Behind and to the Left.

the air supply which permits the acidic solution to back flush the tubes. If this treatment with water is not effective, an acid run is made and the air turned off momentarily at the end of the run to allow acid solution to penetrate the porous material, but not to attack the steel tie rods.

The original aeration diffuser tubes are still in use.

PLANT AND OPERATING COSTS

The cost data here shown are representative of conditions in 1939. The basis for actual costs is given in the following summary which represents typical operating conditions for the plant as installed.

Equipment

1—Freeport pressure sulphur burner, capacity 25-40 lb. sulphur per hr.

1—SO_2 reaction cell, wood stave tank, 9.5 ft. dia. x 4.375 ft. solution height. Net volume after deducting fixtures 2,270 gal.

1—Wood stave, scrap iron reduction tank, 14 ft. dia. x 4 ft. high, outside.

1—Acid proof pump 1½ in. (Ace).

3—Storage tanks, round wood stave, 6 ft. x 6 ft., outside.

1—Storage tank, square, 4.5 ft. x 5.5 ft. high, outside.

Typical Results of Operation

Rate iron oxidation, 4 g. Fe per liter per hour.

Strength iron oxidized, 30 g. per liter.

Time total batch run, 8 hours.

Strength SO_2 to cell, 3 per cent.*

SO_2 evolved from cell, trace.

Percentage iron oxidized, 99.

Acid produced during iron oxidation, less than 1 g. per liter.

98 per cent conversion of sulphur.

SO_2 cell conversion, per 8 hour batch run—

2,270 gal. solution at 30 g. per liter ferric iron, containing 568 lb. ferric iron, produced from neutral ferrous sulphate.

Power, 8 hp. for 125 cfm. air at 5 lb. and 130 cfm. air for SO_2 at 2 lb., using air from power plant. (50 hp. blower gives 1,100 cfm. at 6.75 lb.)

*Whereas 10 per cent SO_2 would have been desirable, the sulphur burner as installed only furnished 3-4 per cent SO_2.

Phoenix Plant Output, Per 8 Hr. Batch Operation

Lb. Sulphur	Lb. Iron in Solution Advanced as Ferric		Ferrous	
(Combined)	Fe	$Fe_2(SO_4)_3$	Fe	$FeSO_4$
163	189.3	678	284	774

Sulphate Production—Per Batch Cost of Phoenix Ferrous

Power—47.5 kwh. at $0.007	$ 0.332	
Scrap iron—284 lb. at $6.50 per ton.	0.923	
Sulphur—167 lb. at $0.02576 per lb. (small lots)	4.302	
at $0.01155 per lb. (carload lots)		$1.929
Labor—1 shift at $5.00	5.00	
Total	$10.557	$8.184
Cost per pound of contained iron, Fe	$ 0.0372	$0.0288
Cost per pound of Ferrous Sulphate $Fe SO_4 7H_2O$	$ 0.0747	$0.00579

Cost of Phoenix Ferric Sulphate Production—Per Batch

Power—47.5 kwh. at $0.007	$ 0.332	
Scrap iron—190 lb. at $6.50 per ton.	0.617	
Sulphur—167 lb. at $0.02576 per lb. (small lots)	4.302	
at $0.01155 per lb. (carload lots)		$1.929
Labor—1 shift at $5.00	5.00	
Total	$10.251	$7.878
Cost per pound of contained iron, Fe	$ 0.0540	$0.0415
Cost per pound of Ferric Sulphate, $Fe_2(SO_4)_3$	$0.0151	$0.0116

Estimated operating costs, on above basis, have been made for a plant of larger capacity. This is shown as follows:

Computed costs from Phoenix data, for 6,000 lb. $Fe_2(SO_4)_3$ per 24 hours, or dosage of 1 grain ferric Fe per gal. for 12 mil. gal. flow—

Labor—3 shifts at $5.00	$15.00
Sulphur—1,470 lb.at $0.01155.	16.90
Scrap iron—1,678 lb. at $6.50 per ton	5.55
Power—421 kwh. at $0.007	2.95
Cost per day	$40.40
Cost per pound of contained iron, as Fe	$ 0.0241
Cost per pound of Ferric Sulphate, $Fe_2(SO_4)_3$	$ 0.00674

In evaluating costs for these ready prepared solutions, some added consideration should be given to the labor and expense not incurred, but which would be entailed in connection with use of dry chemicals.

Operation of same plant may be reduced to 1 or 2 shifts per day at substantially the same cost per pound of ferric sulphate by using labor in the same proportion.

This same plant, on similar cost basis could produce 10 to 15 per cent acid.

The total cost of plant for producing 2000 lb. of ferric sulphate—$Fe_2(SO_4)_3$—per day including equipment and erection, as constructed at Phoenix during 1939, was approximately $2,500.

Ferric Sulphate From Steel Plant Pickling Liquors

Treatment of industrial wastes is a problem of increasing magnitude and stream pollution abatement has been made the subject of congressional investigation[7]. Acid-ferrous sulphate solutions resulting from pickling of steel have contributed to the stream pollution problem. These ferrous sulphate solutions offer possibilities for production of cheap ferric sulphate where points of application are located in proximity to steel plants. This may further cheapen the cost of ferric sulphate, as two-thirds of the chemical conversion has already been accomplished, when using ferrous sulphate instead of scrap iron as raw material.

As a further adaptation of the autoxidation process, it has been proposed to regenerate pickling acid from the waste liquors[8]. This contemplates production of about 10 per cent acid in the conversion cell. The copperas is calcined, resulting in sufficient sulphur trioxide to bring the cell acid up to 15 per cent. The other product of the calcination is ferric oxide which offers a logical raw material for production of high grade sponge iron.

Recent surveys on stream pollution and water purification were summarized in a report of the West Virginia University Engineering Experiment Station[9], wherein is mentioned the autoxidation process as a means of aiding the abatement of stream pollution.

Engineering Aspects And Conclusions

The autoxidation process, which has been applied successfully to the sanitation field by virtue of improvements here described[10] has been under development for the last 50 years. The recent investigations which have more completely delimited the fundamental operating characteristics, together with availability of suitable equipment and the application of simple, though rugged engineering design, have finally made the process practical.

From an engineering standpoint, the outstanding features are:

Sulphur Burner and Electrical Controls

1—Positive means of SO_2 feed into the conversion cell.

2—Fine subdivision of air by durable aerators without using mechanical agitators in cell, thus avoiding corrosion.

3—Use of standard wood tanks.

4—Minimum of construction requiring lead.

5—Absence of expensive regulating equipment.

6—Gravity flow of the corrosive ferric sulphate solution into storage or reduction tank, thus minimizing expensive pumps.

7—Negligible amount of SO_2 in vent gas from the cell, thus minimizing necessity of building a high stack to vent exhaust gas.

8—Simplified flow sheet.

9—Adaptability to producing ferric sulphate, ferrous sulphate or dilute sulphuric acid without changes in plant arrangement.

Acknowledgments

The writers wish to express appreciation for the cooperative spirit and assistance rendered by associates in this delevelopment. The Freeport Sulphur Company, thru their representatives, Messrs. D. B. Mason, G. A. Cain and B. A. Axelrad, furnished technical advice on sulphur burning; the City of Phoenix, following the progressive policy of its management and Engineering Department, supplied facilities, undertook investigation and sponsored the development of this process, and the Phoenix Sewage Treatment Plant staff, particularly Miss Alice Mathis, Chemist, and Mr. Jack Hatchell, operator, did effective and competent work in conducting laboratory control and plant operation thru the development and operating period. Acknowledgment is also expressed to Mr. A. M. Rawn of Los Angeles for constructive suggestions in preparation of this article.

References

1. S. H. Emmons. "Process of Making Ferric Sulphate." U. S. Patent No. 543,992, filed March 29, 1894.

2. A. M. Clark. "Process for Facilitating the Oxidation of Sulphurous Acid." British Patent No. 3669, filed March 9, 1888.

3. E. S. Leaver. "Process of Making Solutions Containing Sulphuric Acid and Ferric Sulphate." U. S. Patent No. 1,477,945, filed March 29, 1922.
Leaver and Thurston. "Ferric Sulphate and Sulphuric Acid from Sulphur Dioxide and Air." U. S. Bureau of Mines, R. I. 2554, December, 1923.
Oldright, Keyes, Wartman. "Production of Ferric Sulphate and Sulphuric Acid from Roaster Gas." AIME Trans., Vol. LXXIII, p. 84.
O. C. Ralston and C. G. Maier. "The Ferric Sulphate-Sulphuric Acid Process." U. S. Bureau of Mines Bulletin 260, 1927.
F. S. Wartman and H. E. Keyes. "Development of Some Fundamentals in the Ferric Sulphate-Sulphuric Acid Process." U. S. Bureau of Mines R. I. 2839, 1927.
H. E. Keyes. "Innovations in the Hydrometallurgy of Copper, Employing Ferric Sulphate-Sulphuric Acid." U. S. Bureau of Mines Bulletin 321, 1930.
H. E. Keyes. "Aeration of Liquids." U. S. Patent No. 1,823,831, filed July 13, 1927.

4. H. E. Keyes. "Apparatus for the Absorption of Gases by Liquids." U. S. Patent No. 1,952,675, filed Sept. 4, 1931.
H. E. Keyes. "Method of Fixing Sulphur Dioxide as Sulphuric Acid and Ferric Sulphate." U. S. Patent No. Re. 21,215, filed Sept. 4, 1931.

5. H. F. Johnstone. "Removal of SO_2 from Flue Gases." U. S. Patent No. 2,021,936, filed Dec. 8, 1930.

6. G. A. Cain and J. B. Chatelain. "New Low Capacity Sulphur Burner." *Chemical and Metallurgical Engineering*, October, 1939.
George A. Johns. "Miniature Sulphur Burner Treats Feedwater at Necco." *Power*, January, 1941.
Sheppard T. Powell, G. A. Cain and J. B. Chatelain. "Sulphur Burner Applied to F. W. Treatment." *Power Plant Engineering*, May, 1940. U. S. Patent Nos. 2,310,187 and 2,310,173.
S. T. Powell, L. V. Carpenter, L. R. Setter and J. J. Coates. "Recent Trends in Water Treatment." *Chemical and Metallurgical Engineering*, August, 1939.

7. Hearings, Committee on Commerce United States Senate, S. 1691, March 1939.

8. H. E. Keyes. "Sulphating Process and Apparatus Therefor." U. S. Patent No. 2,304,178, filed May 15, 1939.

9. "Selected Papers from the Fifteenth Annual Conference on Water Purification." West Virginia University Engineering Experiment Station, Technical Bulletin No. 21.

10. H. E. Keyes. "Production of Iron Sulphate." U. S. Patent No. 2,332,647, filed Nov. 17, 1938.

CHEMICAL TREATMENT OF SOAPY WASTE WATERS*

by
HARRY W. GEHM**
Associate, Dept. Water & Sewage Research
N. J. AGR. EXPT. STA.
NEW BRUNSWICK, N. J.

WASTE Waters in which the polluting matter consists essentially of soaps are discharged in volume by laundries, scouring establishments, and synthetic rubber plants employing soap solutions in the polymerizing operation. Soap wastes are readily utilized by the bacteria responsible for self-purification in streams and those active in oxidation processes of sewage treatment; such wastes are generally high in oxygen demand. Experiments have shown that the rate of biological oxidation of soaps is essentially the same as that of domestic sewage. Pure soaps require almost twice their weight in oxygen for satisfaction of the five-day B.O.D., and commercial varieties, about one and one-half times.

The Author

In general, the economy of treatment of soapy waste waters (from the standpoint of equipment required, and of operation) dictates that they be segregated from extraneous diluting waters and be equalized so that a waste of relatively constant character be delivered to treatment units. Although rarely practiced, the first of these considerations holds great promise of lowered treatment cost and in many cases can be more or less combined with the second one, which has long been appreciated and practiced.

Treatment of such wastes with lime to obtain precipitation of a part of the soaps is a recognized procedure having been advanced by early English investigations[1]. It is at present used mainly as a method of pretreating laundry wastes prior to discharge into a sewage treatment plant for the purpose of reducing the loading. A number of investigators have published data demonstrating that removals of about 60 per cent of the five-day B.O.D. can be obtained in treating laundry waste water.[2, 3]

*Journal Series Paper, New Jersey Agr. Expt. Sta., Rutgers Univ., Dept. of Water and Sewage Research, New Brunswick, N. J.
(Presented before the Am. Chemical Society, this paper has been released for publication in *Water Works & Sewerage*.)

**Now Technical Advisor, National Council for Stream Improvement, New York.

Treatment with Sea Water

Experiments conducted with laundry waste showed that the addition of waters rich in salts such as sea water, spent zeolite softener regenerant, and mineral well waters to such waste greatly enhanced lime precipitation[4]. Illustrative of the effect of these waters is the curve presented in Fig. 1 in which the effect of varied percentages of spent zeolite softener regenerant on lime treatment of laundry waste is shown.

Examination of this curve shows that B.O.D. removal in excess of 85 per cent could be obtained by addition of the mineral waters alone. Such treatment, however, is impractical because of the large quantity of light sludge formed, some of which settles and some of which floats. Addition of relatively small dosages of lime eliminated floating, producing a rapidly settling and a compact sludge.

Since the main salts contained in these waters are sodium, calcium, and magnesium chlorides and sulfates, some preliminary experiments were made to determine which salts were active in producing this effect. The first experiments were performed to determine the relative effectiveness of calcium, sodium, and magnesium salts in coagulating soaps. The effect of sodium chloride, in combination with the other salts, was also studied because the work with sea water and spent softener regenerant indicated that in such combinations sodium chloride might influence precipitation of the soaps.

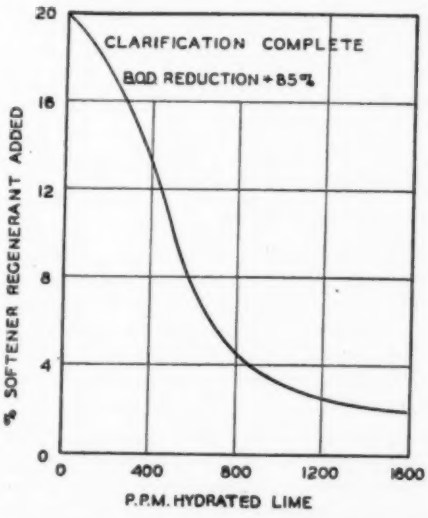


Fig. 1—Effectiveness of Spent Zeolite Softener Regenerant and Lime for Clarifying and Removing B.O.D. of Soapy Waste Water.

Effects of Calcium, Magnesium and Sodium Chlorides

A suspension of U.S.P. sodium stearate having a concentration of 1000 ppm. was prepared. To liter portions of this solution various dosages of magnesium chloride, calcium chloride, and sodium chloride solution and combinations thereof were added. All portions were stirred slowly for fifteen minutes after the chemical was added, to allow reaction to come to completion and assist in coagulation of the precipitated soaps. After settling, samples of supernatant liquor were removed from treated portions showing complete clarification. The five-day B.O.D. of these samples was determined using seeded and supplemented dilution water, and on a sample of the untreated suspension.

The percentage removals of B.O.D. were calculated for all clarified samples and where removal was in excess of eighty-five per cent, the salt dosages employed were plotted. The resultant relationships established are shown in Fig. 2. Examination of the data obtained shows that per unit weight magnesium chloride is 2.7 times as effective in removing the soap as calcium chloride, and 32.5 times as effective as sodium chloride.

Relatively large dosages of sodium chloride did not alter the relative effectiveness of the calcium and magnesium salts, but increased soap precipitation due to its own action. For example, in samples where 5000 ppm. of sodium chloride was added 2.7 times the dosage of calcium chloride as compared to magnesium chloride was still required, and with a 10,000 ppm. sodium chloride concentration a similar relationship held. It appears, therefore, that the resultant removal of soap by combinations of sodium chloride and salts which react to form insoluble soaps is merely a summation of the salting out and precipitating reactions.

Treatment of Synthetic Rubber Polymerizing Soap

A sample of polymerizing soap waste was obtained from a synthetic rubber plant. The material was of the consistency of grease at room temperature. The bulk of this waste is removed from the reactors and recovered. The frac-

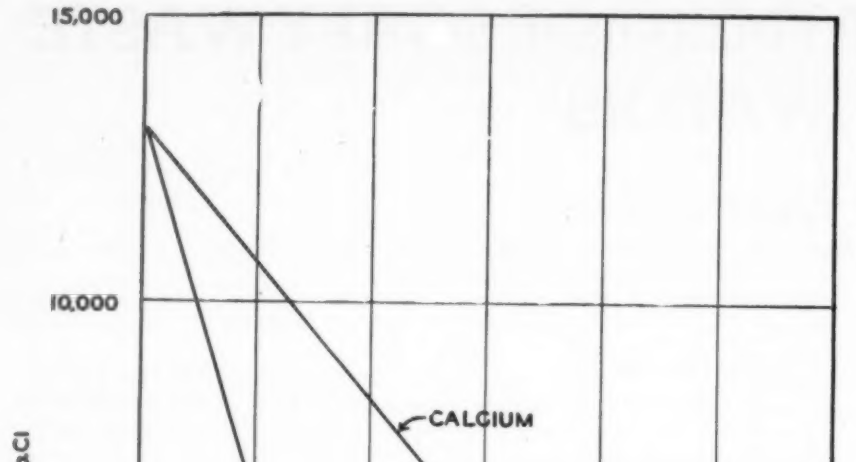


Fig. 2—Effectiveness of Calcium Chloride and Magnesium Chloride in Combination with Sodium Chloride in Reducing the B.O.D. of Sodium Stearate Suspensions.

tion remaining is washed out, producing suspensions of varied concentration. For experimental purposes suspensions of the waste in tap water were prepared. The general procedure of treatment consisted of adding coagulants, in solution, to 500 ml. aliquots of waste suspensions, stirring at slow speed for 15 minutes and settling for 30 minutes. Oxygen consumed determinations were run on supernatant samples withdrawn after settling.

Calcium chloride, magnesium chloride, sea water, and spent zeolite softener regenerant were employed as coagulants. The zeolite reagent had these following contents:

$CaCl_2$—7,144 ppm.
$MgCl_2$—1,703 ppm.
NaCl—13,489 ppm.

Lime alone, lime in combination with calcium and magnesium chlorides, and acid wastes, including pickling liquor, were tried. None of these treatments yielded promising results. Lime alone had little effect when applied in reasonable dosages. When used in conjunction with calcium and magnesium chlorides, lime had little effect except to increase the quantity of sludge formed. Acids and acid salt requirements were found to be very high and the sludge produced failed to settle rapidly.

Calcium and magnesium salts and waters containing mixtures of these salts gave good results as far as clarification and sludge settling were concerned. In this respect, the synthetic rubber waste differed from soapy wastes and sodium stearate suspensions, which produce voluminous curds when such salts are added. A suspension of the rubber waste containing 6572 ppm. total solids produced about 50 ml. of a granular, rapidly settling sludge when treated to the optimum degree in this manner.

Reduction in Oxygen Consumed Value

Reduction of the oxygen consumed value in excess of 95 per cent could be obtained by treatment with calcium or magnesium chloride as shown in Fig. 3, and little difference in the relative effectiveness of the two salts was observed.

Similar results (Fig. 4) were obtained with sea water and spent zeolite regenerant. In these experiments the oxygen consumed value was used as the index of soap removal. The quantity of regenerant required for a given waste water will depend on its content of calcium and magnesium salts.

On the basis of the total solids concentration in the waste suspension, about 0.2 lb. of calcium or magnesium chloride would be required to precipitate, almost completely, one pound of solids from a waste suspension. In order to determine whether this relationship would hold over a wide range of concentrations, a series of the polymerizing soap waste suspensions of from 1,643 ppm. to 10,000 ppm. were treated with calcium chloride and the quantity necessary for optimum clarification was determined for each. Results of this experiment are plotted in Fig. 5. For concentrations of total solids between 3000 and 10,000 ppm. the relationship between solids and required calcium chloride for optimum treatment is linear and the relationship of 0.2 lb. of calcium chloride per pound of solids in the waste seems to hold. Lower solids concentrations require a higher salt to solids ratio.

Discussion

Suspensions of synthetic rubber polymerizing waste, consisting mainly of soaps, were found to react to various methods of chemical treatment somewhat differently from laundry waste and pure soap suspensions. Of these differences, the most important of practical interest is the formation, in suspensions up to 10,000 ppm. concentration, of a granular, rapidly settling sludge on treatment with calcium and magnesium salts rather than the floating curds produced when other soap wastes are so treated.

The most economical of the methods of treatment investigated were the use of sea water, spent zeolite softener regenerant or calcium chloride. Magnesium chloride did not exhibit appreciably greater effectiveness than calcium chloride when added to this waste, whereas the magnesium salt proved more effective in the case of other soapy waste waters. About 0.2 lb. of calcium chloride was required per pound

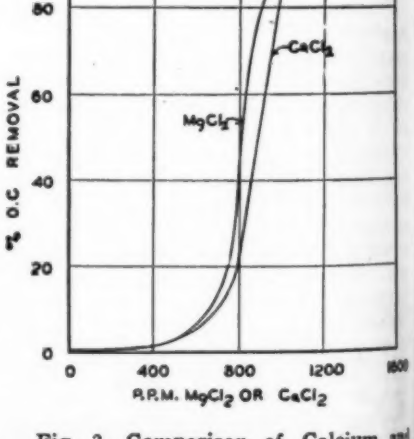


Fig. 3—Comparison of Calcium and Magnesium Chlorides for Reducing the Oxygen consumed Value of Suspensions of Polymerizing Soap Waste.

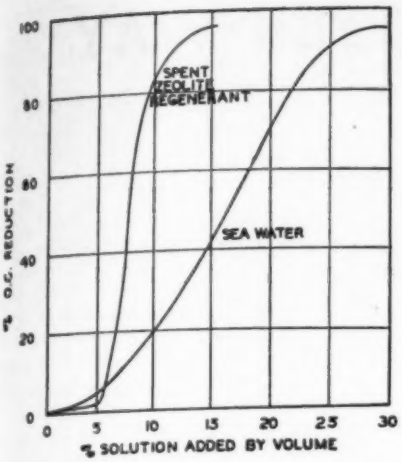


Fig. 4—Effectiveness of Spent Zeolite-Softener Regenerant and Sea Water in Reducing the Oxygen Consumed Value of suspensions of Polymerizing Soap Waste.

of total solids in polymerizing soap waste waters.

Oxygen consumed removals in excess of 95 per cent could be obtained by calcium or magnesium salt treatment. Such removals were accompanied by essentially complete clarification. A pound of total solids was found to consume 0.19 lb. of oxygen, on the basis of the oxygen consumed test. Comparing this value with the 0.2 lb. of calcium chloride required to treat one pound of total solids, the removal of oxygen-consuming matter is equivalent, on a weight basis, to the chemical dosage.

Sludge produced by calcium chloride treatment amounted to about one cubic foot per pound of solids treated, but could be thickened to a lesser volume. This sludge would lend itself to reclaiming and could be combined with the main volumes of waste which is so handled.

Summary

Experiments with soapy waste waters showed that treatment with sea water, spent zeolite softener reagent and mixtures of calcium and magnesium salts produced a high degree of clarification with the formation of a curdled sludge. Magnesium chloride was found most effective. Dilute soapy wash wastes from synthetic rubber polymerizing behaved somewhat differently in regard to chemical coagulation. Waters containing this waste can be treated to a high degree with calcium or magnesium salts or waters containing these salts. It was found that one pound of total solids required 0.2 lb. of calcium chloride, which removed 0.19 lb. of oxygen consuming equivalent present in one pound of waste. This treatment produced about one cubic foot of sludge, which could be thickened and reclaimed together with the concentrated wastes.

References

(1) Wilson, H. M., and Calvert, H. T., Trade Waste Waters, Griffin London, (1913).
(2) Kessler, L. H., and Norgaard, J. I., Sewage Treatment at Army Posts, *Sewage Works Journal*, 14, 757, (1942).
(3) Eliassen, R., and Schulhoff, H. B., Laundry Waste Treatment by Flotation, *Water Works and Sewerage*, 90, 418, (1943).
(4) Gehm, H. W., Volume Characteristics and Disposal of Laundry Wastes, *Sewage Works Journal*, 16, 571. (1944).

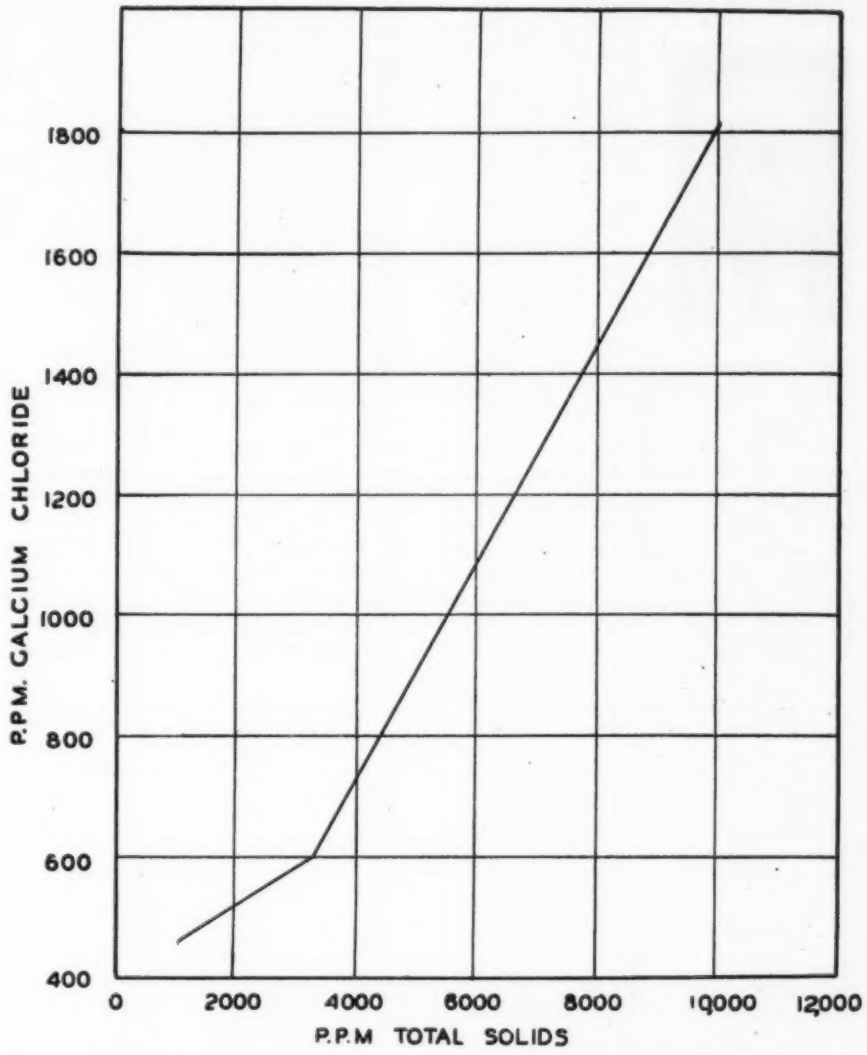


Fig. 5—Relationship Between Total Solids Content of Polymerizing Soap Waste Suspensions and the Quantity of Calcium Chloride Necessary for Optimum Precipitation.

Westchester Water Conference

Grows Into Lusty "War-baby."

The fifth annual meeting of the Westchester Water Works Conference at Greenburgh, N. Y., on July 19, was attended by 150 operators and officials.

James C. Harding, Commissioner of Public Works, Westchester County, was elected chairman to succeed Dan C. Nolan, Jr., town engineer of Greenburgh. Richard M. McLaughlin, director, division of sanitation of the Westchester Health Department, was re-elected secretary-treasurer. New directors elected were: Arthur Jewell, water superintendent, Mount Vernon; J. E. Flanders, manager, New Rochelle Water Co., and Dan C. Nolan, Jr., retiring chairman.

Organized in the early stage of civilian protection, to coordinate the 62 water districts in Westchester County, the conference has steadily expanded. An active program for the coming year is anticipated.

Back Volumes Wanted

If you have 12 complete issues of WATER WORKS & SEWERAGE for any year, or bound volumes, please give us the years and the price you would be willing to accept per volume.

Circulation Department
Water Works & Sewerage
330 South Wells Street
Chicago 6, Illinois

SLUDGE PUMPING—A BETTER WAY

By CHARLES YEOMANS
President
YEOMANS BROTHERS CO.
CHICAGO, ILL.

JUDGING from recent writings on the subject, there is room for improvement in sludge pumping and recirculating equipment now in general use in sewage treatment plants in this country. This article offers several suggestions which might do much to mitigate some of the difficulties and dangers presently complained of. The author's company manufactures plunger and centrifugal pumps as well as pneumatic ejectors for pumping sludge.

The Author

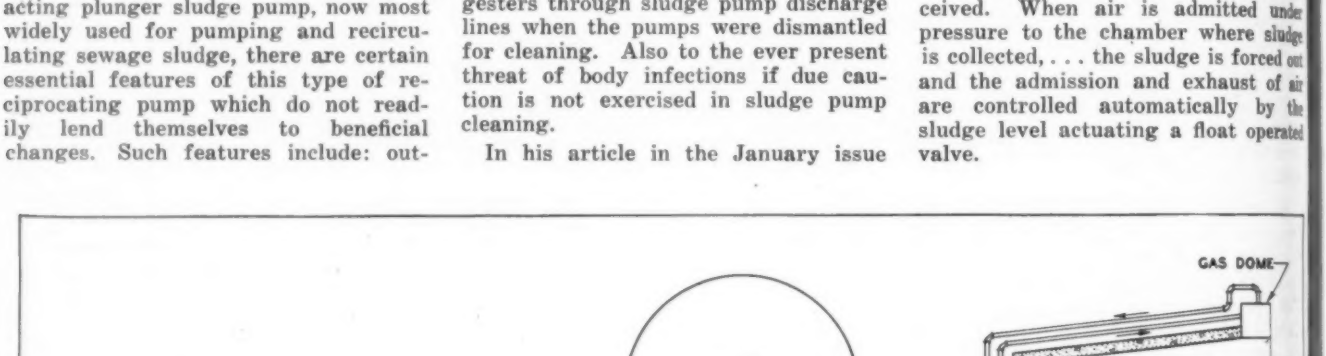
While progress has been made in the design and construction of the single acting plunger sludge pump, now most widely used for pumping and recirculating sewage sludge, there are certain essential features of this type of reciprocating pump which do not readily lend themselves to beneficial changes. Such features include: outside packed plungers of large diameter, guided only by packing, with stuffing boxes difficult to maintain; intake and discharge valves opening and closing with each stroke or about fifty times per minute; restricted valve areas and abrupt turns. Repacking of stuffing boxes and cleaning of valves may be required at frequent intervals and in time the plungers may have to be refinished. Gears or other forms of speed reducers have to be cared for. As long as motor drives are a part of the pump assembly short circuits or arcing in starting devices may ignite an explosive mixture of gas and air which may be present if valves have been opened, or should there be a gas leak. "Practice Manual No. 1", issued by the Federation of Sewage Works Associations, makes reference to the death from asphyxiation of plant operators caused by gas back flow from digesters through sludge pump discharge lines when the pumps were dismantled for cleaning. Also to the ever present threat of body infections if due caution is not exercised in sludge pump cleaning.

In his article in the January issue of *Waterworks and Sewerage*, Mr. C. R. Velzy presented observations which seem to justify the critical assertions made herein. He cited one plant operator who built a concrete dam around his plunger sludge pump to limit the flow of sludge over his pump room floor during valve cleaning operations.

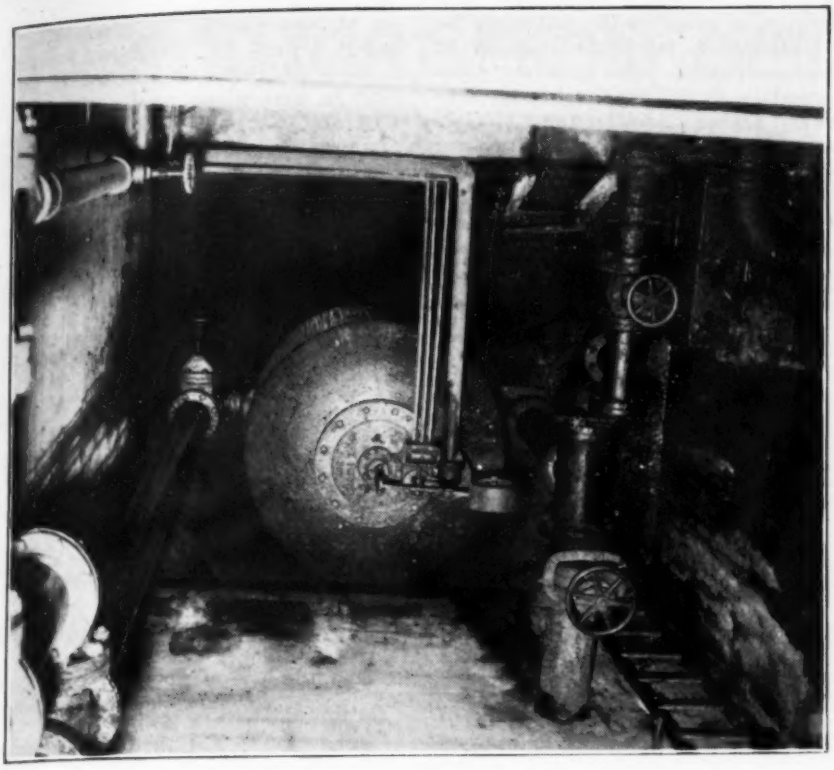
The Pneumatic Ejector

In contrast to such criticism of the plunger pump as may be deserved, it appears that in England there is no sludge pumping problem at all—that for well over half a century English sanitary engineers have avoided the difficulties of sludge pumping alluded to by using pneumatic ejectors for sludge transfer.

Very likely the design and principle of the pneumatic ejector need no emphasis here. It is about as simple a mechanism as could well be conceived. When air is admitted under pressure to the chamber where sludge is collected, . . . the sludge is forced out and the admission and exhaust of air are controlled automatically by the sludge level actuating a float operated valve.



Diagrammatic Sketch of Sludge Ejector Operated With Digester Gas
Functions Without Gas Waste and is Adaptable to Sludge Recirculation Without Danger of Air Entrainment



A 250 GPM. Ejector at New Castle, Pa.
(Fuller & McClintock, Engineers)

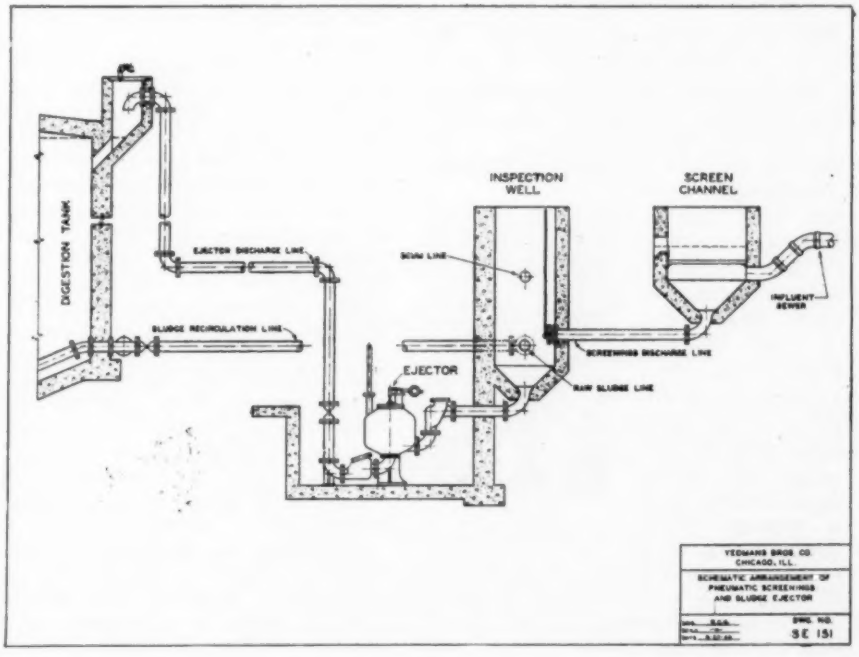
Has Served Since 1926 for Sludge Transfer Service With Satisfactory Trouble-free Performance, Operating on Air

Chief among reasons advanced for not using pneumatic ejectors is an alleged menace of air passing from the ejector into the digester and causing an explosive mixture, but this could occur only in case of a poorly designed or improperly adjusted air control valve. As a matter of fact the objection is based more on theory than on practical considerations, for it must be remembered that to produce an explosive air-gas mixture the air content must more than equal the gas content of the mixture. Moreover, it is often difficult to keep plunger packing tight in plunger pumps, so that when operating with suction lift or partially obstructed suction they may pump air into the digester for long periods without detection, and in many installations air is purposely admitted to the pump through snifter valves employed to eliminate pounding. Of the two types of equipment the ejector seems less likely to be guilty of this kind of misdemeanor. Furthermore, means are available for preventing the entrance of air into the digester from either plunger pumps or pneumatic ejectors, so that question does not seem to require serious consideration in either case.

In the ejector, due to the mechanical character of the air control, there is no possibility of ignition of an explosive mixture of air and gas should such a mixture accumulate in the ejector receiver. No electrical devices or wiring are required for ejectors, and they can be completely isolated from the motor driven compressors supplying the air. The danger of explosion, therefore, with the pneumatic ejector, would seem to be much less than with plunger pumps. As to advantages on the maintenance side, there is only one stuffing box required on the ejector, and this is subjected only to air pressure. The packing in this stuffing box seldom requires replacement in less than five years. Check valves open and close only once per minute and will pass any solids that will go through the piping. The ejectors will handle settling tank skimmings and screenings very satisfactorily. Acceptable designs for handling screenings and scum are such that the smallest ejector will pass solids up to 6 in. diameter, and inlet and discharge check valves of special type and correctly located are essential. Velocity in discharge check valves and piping should be not less than 2 ft. per second. Mechanical stroke counters can be used to provide a reliable and accurate means of metering pumpage. The ejector can, of course, be operated with compressed air maintained in the plant for other purposes, and the power consumption is no greater than that of the plunger pump. In fact, in capacities up to 150 gpm. and at heads from 20 to 30 feet, the power demand of the pump is higher than that of the ejector operated with a well designed rotary compressor, while the loss of efficiency due to wear and tear is far greater in the pump than in the ejector.

Gas Operated Ejectors

In plants where gas is stored in holders under compression there seems to be no reason why the sludge ejector should not be operated by gas instead of air, the exhaust gas from the ejector being returned to the digester. The ejector would thus add little to the plant power cost and would eliminate one motor and wiring therefor. The



Schematic Arrangement of Air Operated Ejector

Typical Installation for Transfer of Screenings, Skimmings and Sludge from Industrial Wastes and Domestic Sewage

gas would be utilized but not consumed by the ejector and would still be available as fuel for gas engines as well as for heating buildings and digesters and other purposes, and some of the power used in compressing the gas for storage would be recovered. So operated, the ejector could not even through accident contribute to the explosion hazard, as air could not enter it at any point. Thirty p.s.i. gas pressure would be sufficient for any total dynamic discharge head up to 65 ft., and as the contents of the receiver of the ejector must be displaced in 30 seconds to allow for refilling within one minute, the flow rate in discharge piping would always be twice the gpm. capacity rating, which would help to keep the sludge lines clear. A wide variation in flow rate would be obtainable by regulating the gas pressure. The volume of free gas required by the ejector per gallon of sludge pumped would vary from about .25 cu. ft. at 10 ft. discharge head to .50 cu. ft. at 65 ft. total discharge head.

The slight back pressure in the gas exhaust line from the ejector to the digester would be equalized by a corresponding head differential in the sludge inlet to the ejector. In a plant without gas holder a compressor with small storage tank for either air or gas could be provided for sludge ejector operation.

Impressive Background and Service Record

Impressive testimony to the pneumatic ejector's highly efficient and safe operation is given by the following list of installations in England, made by Messrs. Hughes and Lancaster, the originators of this type of lift for sewage and sludge. Some of these ejectors have been in continuous operation for nearly 60 years. Listed are the locations and rated capacities in gallons per 24 hours.

Southampton	3,280,000
Compton Gifford, Plymouth	216,000
Dorking	288,000
Leyland	288,000
Staines	360,000
Rochdale	288,000
Norwich	216,000
Hampton	72,000
Walthamstow	144,000
Merton R. D. C., Croydon	288,000
Manchester	864,000
Hanley, Staffs	288,000
Bury	1,008,000
Brighouse	576,000
Barking	864,000
East Retford	360,000
Stockport	576,000
Epsom	576,000
Gosport	144,000
Ilford	216,000
Oadby, Leicester	72,000
Leigh & Atherton (Lancs.)	288,000
Luton	216,000
Bellshills & Mossend	144,000
Farnborough	72,000
Romford	288,000
Merton	144,000
Enfield	432,000
Haslingden	720,000
Hertford	288,000
Edmonton	432,000
Hampton	72,000
Shirley & Freemantle	720,000

In these installations some, but not necessarily all, of the ejectors are used for raising sludge. In Gosport, for example, there are 19 stations but only one of these pumps sludge. In that station the practice has been to open the sludge ejector check valves for examination once a year. A 250 gpm. ejector of the same type in similar service at New Castle, Pa., since 1926, is reported by J. D. Alexander, Superintendent of Public Properties of that city, to have given good performance. Ejectors in handling solids removed from meat packinghouse wastes at South St. Paul, Minn., and elsewhere have over a number of years given satisfactory service in automatic operation.

By Way of Summing Up

To sum up, the desiderata in primary sludge pumping equipment appear to be as follows:

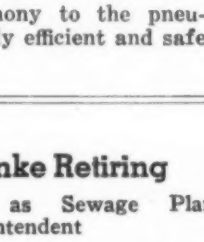
1. Ability to pass solids up to pipe sizes without stoppage.
2. All mechanical air pressure and exhaust control.
3. Isolation from electric motors and controls.
4. Absence of large diameter stuffing boxes under sludge pressure, difficult to keep tight.
5. Ability to handle skimmings and screenings.
6. Daily operation with removal of any access covers at most a few times a year.
7. A bone dry installation—no drips whatever.
8. A thoroughly clean job such as every operator is entitled to if it is obtainable.

It may seem paradoxical to look to apparatus designed two generations ago (and not essentially modified since then) for a 1945 solution of this vexatious problem, yet these obvious facts speak convincingly for themselves.

George Behnke Retiring

After 32 Years as Sewage Plant Superintendent

On April 14, 1913, George Behnke went to work in the Water Department of Oberlin, Ohio. About a month later he was sent to operate the Sewage Treatment Plant and was told to continue there until told different. Since that time 32 years have rolled by and George Behnke has never yet been "told different", so he must have proved eminently satisfactory to all concerned as a sewage works operator and later as plant superintendent through these 32 years. Now he is retiring for a well earned vacation at 70 years of age. But, says George Behnke, "I am still as good as any man of 40." And with that we can agree.



Veteran Geo. O. Behnke

From newspaper clippings we see that Oberlin's city manager, H. V. Hahn, had this to say about George Behnke: "There is nobody and never will be anyone, who has given the faithful and long service to Oberlin that George Behnke has." And the City Council in recognizing as much passed a resolution stating—"*Be it Resolved*—that this Council expresses its appreciation for the splendid and faithful work of George O. Behnke, and his fine spirit of cooperation with all village officials and employees. It is with regrets that this association must be terminated".

Mr. Behnke has long been a member and consistent attendant of the several conferences of the Ohio Sewage Works Operators' Association and annual meetings of the Sewage Works Federation in which he is a member of its veterans' organization—"The Quarter Century Operators' Club," which boasts a current membership of twenty-five "old-timers."

To George Behnke, long a subscriber to *Water Works and Sewerage*, and 70 years young, we wish a long and happy span of years of enjoyment after a publicly recognized record of service and ability to "get along" with his many bosses and associates in public office during 32 years of continuous, efficient and appreciated service to his community.

Goit Appointed Chief Engr. Los Angeles Water Division

(A Correction)

Laurance E. Goit

In our July issue with the item on page 215, announcing the elevation of Laurance Goit to succeed "Bill" Hurlbut as Chief Engineer of Water Works in Los Angeles, we by some unexplained means used the wrong cut. For the sake of the record we present herewith the true likeness of Laurance Goit, with our apologies for the mistake.

STRAIGHT FROM OUR READERS

What They Tell Us and What They Ask Us About—

PUMPS AND VALVES

From personal interviews, Water Works and Sewerage is learning the thoughts, likes, dislikes, problems and questions of its readers. Because we believe other readers will be interested in the problems, questions and comments of various superintendents, engineers, chemists, operators, and consultants in the field of water purification and sewage disposal, we shall publish these comments whenever space permits.

Each feature page will consist of quoted statements taken from various interview reports. In several cases the particular topic may require more than one issue for the material on hand.

If you have not yet been interviewed, and have any thoughts on these subjects, we shall be pleased to receive your comments by mail for publication in future issues.

Well Pumps

"WE'VE been having trouble with our pumps losing vacuum and going off the line. It's a hard job getting them back on. Why, I don't know. My suction lines are below the lines down in the well. There's a good three or four feet of suction. Maybe they don't tighten all the glands. On the electric pumps they forget to trip the low voltage relays when the load drops and the motors stop."

* * *

"Chemicals are fed into the wells by means of a rubber hose and the only difficulty we have run into there is that sometimes the pump doesn't allow enough clearance to insert the hose or it pinches the hose and stops the feed. I think, though, that pump companies are developing smaller pumps with larger capacity so this problem may be eliminated."

Centrifugal Sewage Pumps

"We have to let that centrifugal leak like that. The leak cools the packing so it won't heat up and wear out too fast. We had a water cooling arrangement on the pump but the State Board of Health made us take it off. I don't know what else we can do. We use a good grade of graphite and asbestos packing but we have to let a little cooling water leak through or it will wear out in no time."

* * *

"With the bar screen and fine screen arrangement, rags ordinarily do not come through to clog the pumps. We do have to clean out the rags that clog the pumps in one of our pumping stations. We have only a bar screen there and the rags filter through. I hope to be able to put in a communitor one of these days."

* * *

"We have very little trouble with rags getting in our pumps. Our pumping station is equipped with two communitors that chop them before they get to the plant."

"We haven't any trouble with rags getting to our pumps. Our bar screen seems to take care of them. It's only a one inch screen and it may be that there aren't many rags in our sewage. If I really had a tough rag problem I'd get the pump that the . . . people put out. I've seen them in sewage installations around here but the best demonstration on them was at one of our conventions. They were feeding towels to the pump. When the towels piled up on the screen they have in the inlet, all you had to do was reverse the pump and the inlet became an outlet. A good idea, and it works in these plants I've seen these pumps in."

* * *

"We have two bar screens at the head of the plant. They started out with about ½-in. opening but now they are about an inch wide. Rags slip through and get in our pumps. They clog the propellers on the centrifugals, and the ball valves on the sludge pumps. It isn't so bad cleaning the centrifugals; they have a cleanout plate and you just reach in and pull the stuff out with a pair of pliers, but the ball valves is another matter." (See next column: Ed.)

Pump Costs and Parts

"I can't understand why they don't give us some actual job installation figures when they are trying to sell us pumps. What we want to know are things like capacity, size of motor needed, rpm., and the type of gears and bearings. The Commissioner asked me the other day when we were going to buy a machine on which we wouldn't have to send all the way cross country for parts. For instance, it would influence us to buy if we knew that the pump was equipped with . . . bearings. We can get these in . . . which is quite handy in case of a breakdown.

* * *

". . . It takes a long time to get repair parts for the . . . pumps. That, in addition to the extra cost of buying them through an agent, caused us to switch to . . . When a part goes on a pump, you usually need it in a hurry because you can't stop pumping sewage.

Sludge Pumps

"Our sludge pump leaks through the packing too. There's a constant drip at the piston that goes down into that trough. We use the best grade of packing we can get on that. I don't know of a better packing and haven't found one that will stop the leak."

* * *

"We don't get many rags in the sewage and the only time any of them filter through is when the time controlled cleaning device on the bar screen is off or when we have an unusually high flow. We run into more trouble with sticks slipping through the 1-in. bar screen and getting caught in the ball valve of the sludge pump than we do with rags. I did see one way of eliminating the messy job of taking down the sludge pump when the ball valve gets stuck. It was at the Bowery Bay Plant in New York City. They had the bar screen followed by a fine screen."

* * *

"Rags keep the ball valve on the sludge pump open and we have to take the pump apart to clean it. It's a messy job and we have to do it every time we pump. What we need, I guess, is a finer screen with some sort of a mechanical cleaning arrangement."

* * *

"We barge our sludge to sea and, when we're loading the barges, these sludge pumps are going like the devil. About every 15 minutes we have to take a pump down and clean out the rag particles. They clog the pistons like concrete. If someone ever invents a pump that will take care of the rags so that they won't clog the pump, it will be a God-send. We built a chopper and installed it in back of our fine screens but that isn't the final answer for the particles still cause trouble."

* * *

"We have three . . . pumps and two . . . We like the . . . much better. One

is a finer looking pump all around and operates well. Both of them are fairly new and I really can't say much yet on maintenance. I think one will give better service than the other.

One minor though very annoying thing about the . . . is that they overflow and mess up the floor of the plant. We had to build a cement trough around them to catch this overflow. The . . . overflows a little but that is easily taken care of by installing a small pipe."

Standby Power

"Another thing that should become more prevalent is the provision for a spare source of power on electrical driven pumps in case of a power failure."

VALVES

Control Valves

"I'd like to see somebody find a better material for the diaphragms in the control valves. The rubber and canvas ones we have now crack and it's a job replacing them."

Sludge Line Valves

"Those valves are usually put in with the plant but for replacements we would be interested in the ease of operation, resistance to corrosion, etc. We tried some plug valves here but ran into lubricating difficulties. The grease wouldn't get down in the valve. We had to change the system of lubricating and install an extra grease pipe."

Water Main Valves

"The thing that stands out in my mind about . . . Co. valves is that they can be installed without stopping service. I saw them install a great big valve while the pressure was still in the line and it really was an impressive job."

* * *

"When it comes to valves there's only one thing I think of and that's the beautiful engineering job they did on the valves in the concrete roads. They're set in an 8-in. round valve box so that there's just room enough to put a key down to open or close the valve. You know what happens when we have to pack a valve like that? We have to chop a hole in the concrete road. Then maybe the state says you can't chop just that little hole. You have to take out a section. So we spend a couple of weeks just packing a valve. I understand they are using manholes now, though. I shouldn't wonder."

Ed. Note: Persons interested in pumps and valves should also be interested in the comments on packing which was the subject of an earlier "Straight From Our Readers" on p. 178 of the May, 1945, issue. Additional comments on these subjects are invited for the benefit of our readers generally.

Motor Operated Valves

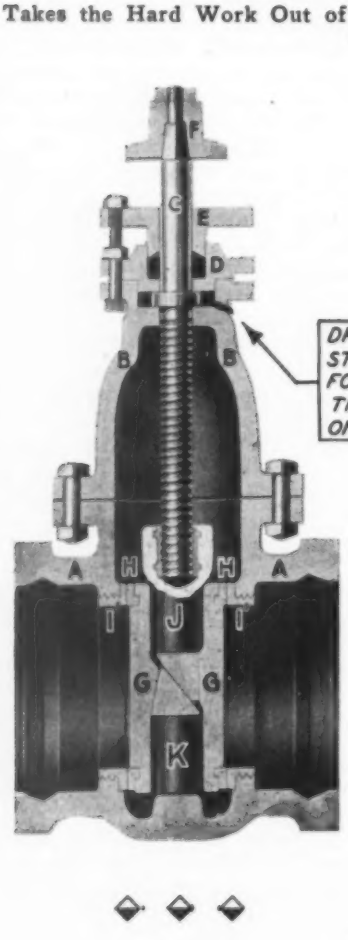
"Each of these motor operated valves is a complicated proposition. They are controlled by electric motor, solenoid or by telephone. Each application may be different and the . . . company will modify the design. Whenever I have a job involving one of these valves I contact the company."

Check Valves

"I'd like to see a better designed check valve. The loss of head in them could be improved and the way they slap down with a crash might be eliminated."

Valve Lubricating Scheme*

Takes the Hard Work Out of Valve Operation; Precludes Twisted or Broken Stems.



We have a 48-in. motor-operated gate valve that has given us unending trouble from the standpoint of being hard to operate. In fact, conditions finally were so bad that we had to "butt" it, using the backlash in the gearing and stem to get momentum to carry through for another turn on the stem. Even visits from factory experts failed to produce beneficial results.

We finally hit on the idea of lubricating the thrust collar on the valve stem. We reasoned that at least it could do no harm and might do some good. Accordingly, we drilled through the bonnet of the valve into the opening containing the thrust collar, tapped the hole for ⅛ in. pipe thread, and inserted a standard Alemite fitting. Using an Alemite pressure gun we pumped automobile water-pump grease into the area around the thrust collar.

Success at last: after the first few revolutions while the grease was working on the bearing surfaces, the motor and gears sounded as though they were coasting. In the two years that have elapsed the valve has been operated hundreds of times and it still operates as easily as when it was first greased. It certainly was a happy solution to what might have been a very expensive trouble.

Since then we have drilled, tapped, and greased several 16-in. and 24-in. hand operated gate valves with the same success and it is really surprising to see how much more easily they operate.

*Contributed by Don Calderwood, Engineer, Pennichuck Water Co., Nashua, N. H.

Kozma Leaves Rutherford

Joins Harrisburg Engineering Firm

As of August 1, Albert B. Kozma will be associated, in the capacity of assistant engineer, with the firm of Gannett, Fleming, Corddry, and Carpenter, consulting engineers of Harrisburg, Pa. Mr. Kozma is the well known superintendent of the Joint Meeting Sewage Treatment Plant of Rutherford, East Rutherford, and Carlstadt, N. J.

In this latter position, Mr. Kozma has contributed greatly to the affairs of the New Jersey Sewage Works Association and has published many articles of technical interest and importance on sewage plant operation. Mr. Kozma's most recent article dealt with the subject of cathodic protection of mechanical sewage filters. It appeared in the April 1945, issue of *Water Works and Sewerage*.

Schroepfer Joins Univ. of Minnesota Staff; Mick to Become Ch. Engineer Twin City Plant

Effective Sept. 1, George J. Schroepfer will leave his position as Chief Engineer and Superintendent of the Minneapolis-St. Paul Sanitary District, and will accept an appointment as Professor of Sanitary Engineering at the University of Minnesota.

Geo. J. Schroepfer

Kerwin L. Mick

George J. Schroepfer has been associated with the Sanitary District for the past 17 years, first as Asst. Engr., and Prin. Asst. Engr. on the preliminary investigation of the Twin Cities Sewage Disposal Project, then as Ass't. Chief Engineer during design and construction, and for the past seven years as Chief Engr. and Sup't.

Mr. Schroepfer will be succeeded at the District by Capt. Kerwin L. Mick, now in the Sanitary Corps of the Army. Capt. Mick has been with the District since 1931, first as Chemist and as Chief Chemist since 1935.

Mr. Schroepfer, who has been a lecturer in San. Engineering at the Univ. of Minnesota, is a Past President of the Federation of Sewage Wks. Associations, and the N. W. Sec. of Am. Soc. C.E., and at present is Secretary of the San. Engineering Div. of Am. Soc. C.E. and a member of the Comm. on Water and Sewage Works Development. He is also a member of AWWA, APHA, and the Minn. Assoc. of Prof. Engrs.

Mr. Mick is a graduate chemical engineer from the Univ. of Minnesota, a registered Prof. Engr. in Minnesota, and a Past President of the Central States Sewage Works Assn. He is a holder of the Radebaugh Award of the latter association, and the George B. Gascoigne Award of the Federation of Sewage Works Associations.

Yakima, Wash. Raises Water Rates to Pay for Sewage Treatment

The Yakima, Wash. sewage treatment plant is now being operated by the Yakima Water Dept. To pay the cost of operating the sewage plant Yakima has added 20% to the water rates straight through.

Yakima now, like many others, has a "Dep't of New and Used Water" which it intends to make self-supporting.

CUBES AND CUBE ROOTS

(Contributed by W. F. Schaphorst, M.E., Newark, N. J.)

This simple scale will solve any cube root problem without the necessity of hand calculations.

For example, what is the cube root of 100?

Find the 100 in Column A and the answer is instantly found in Column B as 4.64. Much quicker than figuring.

The cube root of 200 is 5.85; the cube root of 1,000 is 10; and so forth indefinitely.

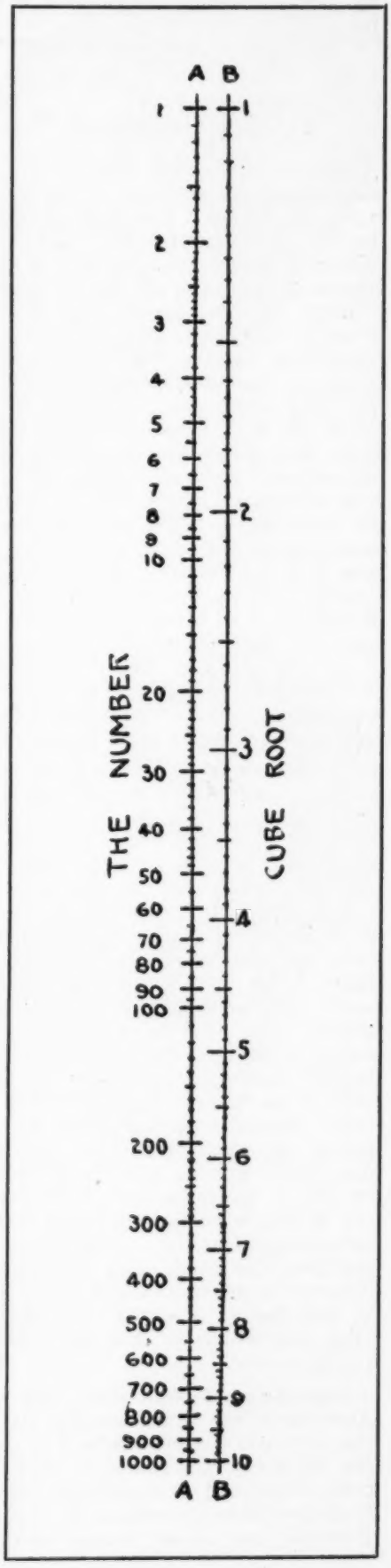
The same scale can also be used for finding the cube root of any number greater than 1,000, but one must watch the number of digits. Cube root always goes in "threes." Thus if you want to find the cube root of 4,000, cut off three digits from the right and four remains. The answer will then be 15.9. The cube root of 4 is 1.59 and therefore for 4,000 the cube root will be 15.9. It is very easy.

To find the cube root of 60,000 or 60,000,000 the result is found opposite the 60. Thus for 60 the cube root is 3.92; for 60,000 it is 39.2 and for 60,000,000 it is 392.

For quantities less than one the method is similar. Thus the cube root of .001 is 0.1. The cube root of .02 is 0.271, and so forth. You can't make a mistake.

In other words, when you move the decimal point three places to the right in Column A it must be moved one place to the right in Column B. And when the decimal point is moved three places to the left in Column A it must be moved one place to the left in Column B. It is always in "threes."

Also, the same scale may be used for finding the cube of any number. Thus, what is the cube of three? Find the 3 in Column B. The answer, 27, is found opposite the 3 in Column A. Use the scale enough to become familiar with it and you will dislike hand figuring more than ever. It is not absolutely perfect, of course, but it is close enough for most practical computing purposes. It is a time saver.



The Editor's Comments

A Cross-Connection Policy Pattern

Many of our readers will already have seen in the May issue of the Journal of A. W. W. A. the new "Rules and Regulations Covering Cross-Connections and Inter-Connections" developed and adopted by the Am. Water Works & Elec. Co. for use by its seventy-odd operating companies situated in various sections of the country. So important do we consider this development of rules, regulations and policy on cross-connections, as established by America's most important and largest privately controlled group of water utilities, that we prevailed upon John H. Murdoch, Jr., counsel for A. W. W. & E. to prepare the article featured in this issue. This article incorporates the adopted "Rules and Regulations" and explains the now published policy of a private water company which so admirably recognizes its *moral* responsibility in the matter of eliminating all cross-connections which may be classified as objectionable, and also plumbing and inter-connection hazards of known existence. This meeting of a *moral* responsibility is construed as being in sharp distinction to any assumption of *legal* responsibility. And we believe that what we like to call "The American Policy" constitutes a development of far reaching import which may well be considered a general pattern for the water utility industry as a whole—publicly as well as privately owned.

In American's classification of cross-connections we are not sympathetic toward the classification "tolerated cross-connection." If the situation existing is one only to be "tolerated" it would seem to be an undesirable connection, the elimination of which is ultimately desirable even though it may not be considered a *marked* potential hazard. If this be as we interpret it, then the more appropriate and descriptive classification might better be "provisional" rather than "tolerated." To us there is but little differentiation between "tolerated" and "objectionable" cross-connections—both would seem objectionable. That there is some support to this contention is found in the fact that at least one State Sanitary Engineer prevailed upon Mr. Murdoch's company to drop the "tolerated" classification from the rules for those companies located in his state—i.e. issue no approval of continuance of "tolerated" connections. American's counsel points out, however, that first of all even a "tolerated" connection must meet any existing or future public regulatory standards applying to cross-connections, inter-connections, or interior piping and plumbing. And, when commenting on the regulations in the one state which prohibits cross-connections of American's "tolerated" classification, he states that "Our only regret is that more states have not taken similar action."

Regardless of definitions and details comprising American's new "Rules and Regulations," which reveal this company's public spirited cross-connection policy, Mr. Murdoch aptly points out that mere publication of these rules will automatically lessen the number of hazardous cross-connections in the communities served. Further, that object lessons resulting from detected wilful violations will go even further toward progressive elimination. Of great import also is the fact that a number of cities have adopted new ordinances legalizing American's new "Rules and Regulations" and already one important state public utility commission has voted approval of the Rules, permitting them to be filed as part of the tariff of American companies operating in that state. Such actions constitute ample evidence that our suggestion that American's "Rules and Regulations Covering Cross-Connections and Inter-Connections" may well be considered as a general pattern for all water utilities the country over—publicly as well as privately-owned systems.

We Need Your Help

Each year when we produce our annual Reference and Data Number we try to improve it, and to produce as nearly as possible a letter-perfect issue. We try to spot and eliminate all errors, defective typography, misplaced lines of type, etc., which may have been found in issues of earlier years. When one considers that there are more than 400 pages in one of these special issues, and when appreciating the limited editorial staff available to handle such a voluminous issue, it can be appreciated that it is next to impossible to catch every error or detect every imperfection. Then, too, the present green-help situation in the printing industry makes the problem more difficult than ever before.

Interestingly enough, after the appearance of each reference issue we receive a large number of letters complimenting us on the issue, but rarely do we receive what to us is equally desirous—namely, constructive criticism, or the pointing out of errors and imperfections found by our readers. This year, as usual, we have received many complimentary letters on our 1945 Reference and Data Issue, and next to no criticism or direction of attention to errors and imperfections.

What we earnestly desire is help from our readers in this matter. It occurs to us that right now is the best time to ask for such help from all who have now had a chance to examine the 1945 issue. It will be highly appreciated if, while some error or typographical imperfection noted by you in the current issue is still fresh in your mind, that you will assist us by calling it to our attention as early as permissible. And, also, at any time during the year that such imperfections may be noted in this year's or earlier issues we hope that you will point them out to us so that further issues may be freed of these imperfections.

Perhaps we should not expect to reach absolute perfection with an issue of such size, but with your help we at least can do a better job than otherwise. So, please lend a hand as the opportunity occurs. You can be assured of our appreciation.

L. H. Enslow

Some data from a steel mill that apply to scale in water heaters

Scale is a problem wherever pipes carrying hard water are exposed to heat, whether they are in a home water heater or in a reheating furnace in a steel mill.

Steel mill skid pipes, which form a path on which billets to be reheated are slid through the furnace, get rougher treatment, with furnace temperatures of 2500°F. and white hot billets sliding along the top surface—but the thermal conditions in home water heaters are equally severe.

In both instances, the simplest and most effective solution of the problem is the same—threshold treatment with Calgon.*

The photograph tells the story. Both pipes were in service for eight months, but water circulating through the one at the top was treated with Calgon. As a result, it is just as free from scale as the day it was installed. And note how well Calgon has controlled corrosion of the bare iron surface.

In hundreds of American communities, Calgon is used in water supply systems to prevent scale, inhibit corrosion, stabilize pH values and prevent precipitation of dissolved iron. A few ppm is all that is required.

Let us send you full information about it.

Calgon is the registered trade-mark of Calgon, Inc., for its glassy sodium phosphate products.

HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.

MEETINGS SCHEDULED

Federation of Sewage Works Ass'ns

The Federation's Annual Conference, planned for Toronto in September, has been postponed for an indefinite period. However, the Federation's Board of Control will hold its annual business meeting on Oct. 17 and 18, at the Hotel Stevens in Chicago. For further information address W. H. Wisely, Exec. Secy., Illinois Bldg., Champaign, Ill.

Sept. 11—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Sept. 12—SPRINGFIELD, MASS. (Hotel Kimball)
New England Sewage Works Association, Sec'y-Treas., LeRoy W. VanKleeck, State Department of Health Hartford, Conn.

*Sept. 14—PITTSBURGH, PA. (Roosevelt Hotel)
Western Pennsylvania Section A.W.W.A. Sec'y-Treas., E. P. Johnson, 418 Flannery Bldg., Pittsburgh 13, Pa.
(Joint Meeting with)
Pennsylvania Water Works Operators' Association. Sec'y. I. M. Glace, 22 South 22nd Street, Harrisburg, Pa.

*Sept. 19-20—GRAND RAPIDS, MICH. (Pantlind Hotel)
Michigan Section A.W.W.A. Sec'y-Treas., R. J. Faust, Chief, Div. of Water, Dept. of Health, Lansing 4, Mich. (The meeting of the Michigan Section was originally scheduled for Sept. 12-13 at Flint, Mich., and is now replaced by the above meeting.)

Sept. 21—DENVER, COLO. (Shirley-Savoy Hotel)
Rocky Mountain Section A.W.W.A. Sec'y, O. J. Ripple, 517 Majestic Bldg., Denver 2, Colo.

Oct. 6—PAINTED POST, N. Y.
Tri County Water Association (Semi-Annual Meeting). Chairman, E. J. Rowe, 110 Maple Ave., Wellsville, N. Y.

Oct. 10—BATH, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Sup't., Water District, Winthrop, Me.

*Oct. 16-17—SHREVEPORT, LA. (Washington-Youree Hotel)
Southwest Section A.W.W.A. Sec'y-Treas., L. A. Jackson, Gen'l Mgr., Water Dept., Little Rock, Ark.

Oct. 22-23—PITTSBURGH, PA. (Hotel Wm. Penn)
Engineers' Society of Western Pennsylvania. Chairman, H. M. Olson, 171 Longue Vue Drive, Mt. Lebanon, Pa.

*Oct. 23—LOS ANGELES, CALIF.
and
Oct. 25—SAN FRANCISCO, CALIF.
California Section A.W.W.A. Sec'y-Treas., B. I. Burnson, Box 720, Oakland 4, Calif.

*Oct. 30-31—MILWAUKEE, WIS. (Pfister Hotel)
Wisconsin Section A.W.W.A. Sec'y-Treas., Leon A. Smith, Supt. Water Works, City Hall, Madison, Wis.
(Program related to surface water supplies.)

*Nov. 5-7—CHARLOTTE, N. C. (Hotel Charlotte)
North Carolina Section A.W.W.A. Sec'y, D. M. Williams, Supt. of Water & Sewerage, Durham, N. C.

*Nov. 8-9—ROANOKE, VA. (Hotel Roanoke)
Virginia Section A.W.W.A. Sec'y-Treas., W. H. Shewbridge, State Health Dept., 1506 Greycourt Ave., Richmond 22, Va.

---

*ED. NOTE. A.W.W.A. Section Meetings here listed for fall dates are scheduled contingent upon the attitude of the War Committee on Conventions later in the year.

WE'RE GOING TO REWARD YOUR PATIENCE!

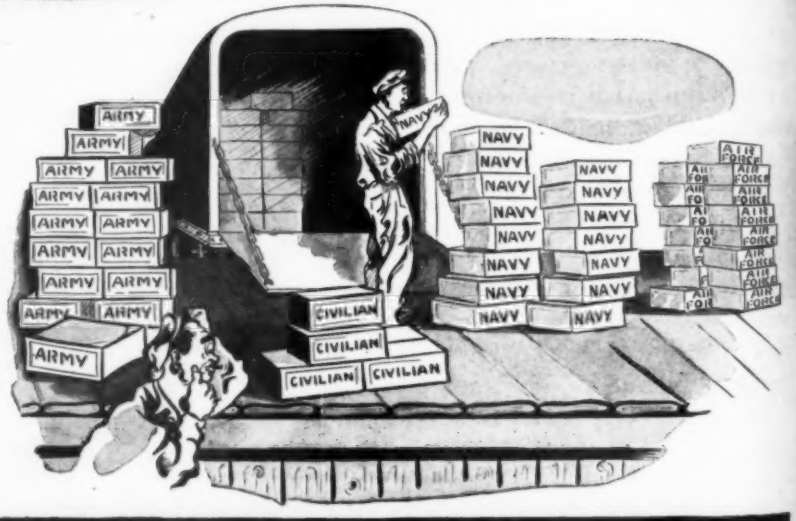
We've never forgotten you, even when we were busy night and day, trying to crowd two days' work into one for Uncle Sam.

We have appreciated, more than we had time to express, your good-natured patience in waiting month after month for goods which you wanted and needed. But neither you nor we could look our boys in the eye when they come home, if we had made no sacrifices to make their going easier and faster.

Whether it's before or after V-J Day, just as soon as Uncle Sam releases a machine that's working for him, it will begin again to work for you.

When we get back to "normal" it will be a bigger and better normal than ever, with many new improvements and new items and vastly increased production capacity. But one thing won't be changed — you'll still get the old-fashioned Hays consideration and the old-fashioned fair and friendly treatment.

BE SURE TO REPLACE WITH ANOTHER HAYS STOP



HAYS
COPPER · BRASS · LEAD · IRON
WATER WORKS PRODUCTS
HAYS MANUFACTURING CO., ERIE, PA.

SIMPLEX

TYPE MO AND MS METERS FOR

WATER &

RAW WATER • FILTERED WATER • CORROSIVE LIQUIDS

SEWAGE

• RAW SEWAGE • ACTIVATED SLUDGE •

METERS

Type MO and MS Meters for service as a flow indicator, recorder, indicator and recorder, indicator and totalizor, recorder and totalizor, or indicator, recorder and totalizor.

SIMPLEX VALVE & METER COMPANY

6743 UPLAND STREET, PHILADELPHIA, PA.

Ready

IN 10 SECONDS

to thread 1" to 2" pipe

Self-contained, semi-automatic

RIDGID **No. 65R**

No. 65R stands up handily on its own feet when not in use.

• You save time and bother when you use the RIDGID No. 65R. It gives you perfect threads on 1" to 2" pipe, with one set of high-speed steel chasers that adjust to size in 10 seconds—no fooling around with 4 sets of dies. Workholder sets to pipe size instantly—no bushings. A fool-proof easy-working threader of rugged steel-and-malleable construction. Order from your Supply House . . . we're doing our best to keep it stocked . . . keep trying.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

PROPER SEWAGE TREATMENT demands adequate air

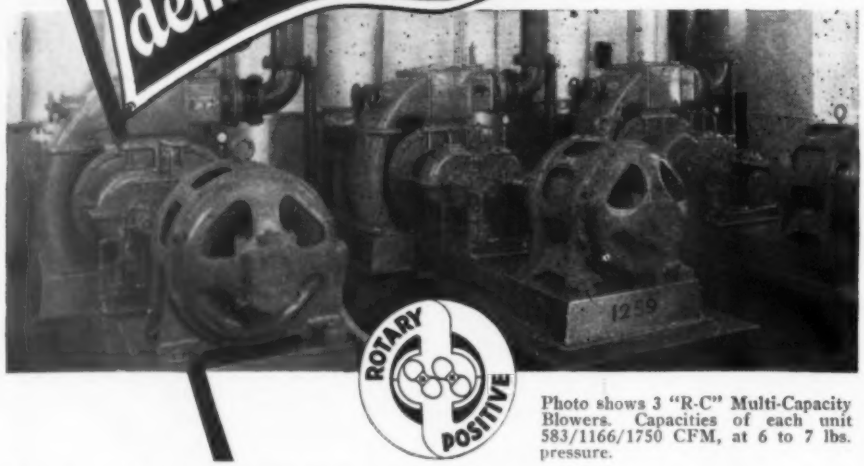
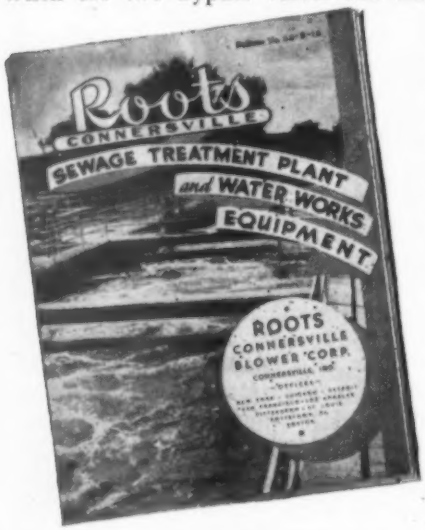


Photo shows 3 "R-C" Multi-Capacity Blowers. Capacities of each unit 583/1166/1750 CFM, at 6 to 7 lbs. pressure.

The Roots-Connersville Multi-Capacity Blower is one of the most effective means of obtaining an air supply flexible and adequate enough to meet varying conditions.

The blower chamber is divided into two sections of different widths. Each represents a separate rotary positive blower, but for economy, compactness, and convenience, both sets of impellers are assembled in one case and carried on the same shafts and bearings.

When the two bypass valves are closed, the capacity of both sections is delivered into the line. With either one of the valves open, that section is by-passed to the suction without compression. This by-passing takes negligible power—only 1% to 2% of the total. Thus, with one unit, driven by one constant speed motor, it is possible to obtain at high economy three different capacities. Let us figure on your postwar requirements.



Bulletin 23-B-12

—will aid correct planning and specifying. It gives much interesting and helpful data on aerating blowers, digester gas meters, and filter vacuum pumps. A copy of this Bulletin will be mailed on request.

ROOTS-CONNERSVILLE BLOWER CORPORATION
ONE OF THE DRESSER INDUSTRIES
508 Mount Avenue, Connersville, Indiana

WRITE FOR BULLETIN 23-B-12

Roots CONNERSVILLE SINCE 1854 Aerating BLOWERS

Here and There with Doc Symons

A group of us were waiting for lunch at the firehouse in Lyons, N. Y., (Genessee Valley Sect. NYSSWA) when Bill Ryan reminded me that it was Lord Kelvin who said, "When you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind."

Lord Kelvin did not invent the "Kelvinator," but his Kelvin scale of absolute temperature uses the fundamentally sound degree centigrade as its unit. Wonder if he would have liked a 13-month year?

* * * *

Guess I'll have to throw away the dark glasses, because James M. Brown, 1st Lt. SnC. recognized me, anyway, on the commuters' train the other day. Jim, who was the operator of the sewage treatment plant at the Lederle Laboratories, Pearl River, N. Y., when I first met him in 1942, at the Albany meeting of the NYSSWA, was later Assoc. San. Engineer in charge of the sewage treatment plant at the Columbia Air Base. In the service for 18 months now, Brown is the Sanitary Engineer on an Army Hospital Ship. Has made several trips to Europe and expects to see the Pacific before this fracas is over. San. Engr. on a Hospital Ship? I suppose besides running a small chlorinator there's the cleanliness of the galley to look after. Anyway, has plenty of time to read W. W. & S., he says.

* * * *

What *is* the connection between membership in Central States Sewage Wks. Assn. and music? Everyone knows that C. C. (The Swede) Larson is Concert Meister of the Springfield, Ill. Symphony Orchestra, but did you know that W. W.

FLEXIBLE SEWER-ROD SET

will pay for itself 5 times every year.

Flexible Sewer-Rod Equipment pays for itself in a short time because it speeds up the work. A few men can clean more underground pipe than an entire crew can with old, outmoded methods. Flexibles eliminate the time-consuming, hot, unsanitary part of the work.

...REQUIRES FEWER DIG-UPS

Flexible methods for cleaning pipe eliminate more than 50% of the necessary dig-ups. When you figure costs for cleaning pipe lines, remember dig-ups are expensive.

...HANDLES ALL KINDS OF JOBS

Flexible manufactures a complete line of tools for every type of pipe cleaning job —there are attachments for removing sand, roots, rocks, marine growths and any other stoppages.

...SAVES TIME, LABOR, MONEY

Flexible tools are fast, efficient and effective. Learn about Flexible method and tools; write for illustrated catalog.

FLEXIBLE SEWER-ROD EQUIPMENT CO.

615 Pickwick Bldg., Kansas City 6, Mo.
1634 Harmon Place Minneapolis 3, Minn.
P. O. Box 694 Gulfport, Miss.
41 Greenway St. Hamden, Conn.

9059 Venice Boulevard
Los Angeles 34, California

401 Broadway New York 13
5645 E. 75th St. Chicago 49
P.O. Box 694, Pittsburgh
P.O. Box 165, Atlanta
147 Hillside Ter. Irvington, N. J.

You Don't Hear About Bottled Water Any More

Not long ago, in many communities, the water you drank was a mark of social distinction or wealth. The well-to-do family wouldn't think of drawing its drinking water from the faucet. These homes always had on hand a case of bottled water—and the town's water supply was disdainfully used only for washing.

Thanks to the water works engineer (and to Chlorine) every community that boasts a public water supply can now offer safe, palatable drinking water for "Judy O'Grady as well as the Colonel's Lady."

Hooker has been supplying uniform high quality Liquid Chlorine to water works, filtration plants and sewerage systems for many years. Officials have learned that in Hooker Chlorine they have a dependable ally in protecting their long record for water purity.

Remember, too, that Hooker's Technical Staff has a wide knowledge of Chlorine. Their experience is available to you on any present problems or future plans involving Chlorine or any of the other Hooker Chemicals.

HOOKER ELECTROCHEMICAL COMPANY

Buffalo Ave. and Ward St.
NIAGARA FALLS, NEW YORK

New York, N. Y. **Tacoma, Wash.**
Wilmington, Calif.

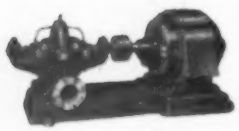
HOOKER CHEMICALS

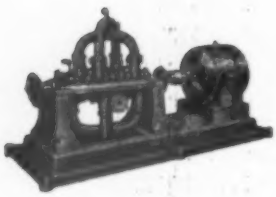
Chlorine ***Bleaching Powder***
Caustic Soda ***Ferric Chloride***

8511

FOR A NEW WORLD OF WATER

PEERLESS now produces HORIZONTAL as well as Vertical pumps





With the recent acquisition of Dayton-Dowd Company, PEERLESS now can supply a pump for any need, including SPLIT-CASE horizontal centrifugals. Vertical and horizontal types are made in capacities from 10 to 220,000 gallons per minute.

If you are planning to "step up" your water supply, consult with PEERLESS. You will benefit by new PEERLESS developments . . . increased precision, improved designs.

PEERLESS PUMPS

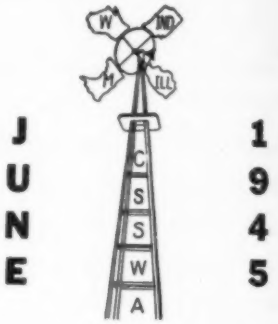
PEERLESS PUMP DIVISION
Food Machinery Corp.

FACTORIES
LOS ANGELES 31, CALIFORNIA
301 West Avenue Twenty-six
QUINCY, ILL. ★ CANTON 6, OHIO

("Bill") Mathews is General Chairman of the Gary, Ind. Symphony Orchestra—and one of the requirements an applicant once needed to become a member of the Ill. State Dept. of Health was the ability to play a musical instrument. Wisely, Klassen, et al, called their band the "Sanitary Syncopators."

* * * *

Too late for the comment in last month's column, came the first issue of the *Windmill*, (The News Bulletin of the Central States Sewage Works Assoc.) edited by Doug Drier (Ill.), Martin Milling (Ind.), George Bernauer (Wisc.), and M. L. Robbins (Minn.). Origin of the name from the four states served is shown in the accompanying cut.



A place to shoot the Sewage Breeze

"Windmill's" Masthead

This column's eyes popped when it saw in the *Windmill* a column headed "*From* Here and There", but after reading it, I suggest it should be headed "*For* Here and There".—And where *do* you fellows obtain that gorgeous heavy slick paper?

* * * *

From a recent issue of *Sewage Gas* (the voice of the Indiana Sewage Works Operator), I learned that Dave "Gas Engine" Backmeyer, Supt. of Sewage Treatment of Marion, Ind., received the Marion Junior Chamber of Commerce Annual Distinguished Service Award for 1944. —Don't you remember when the good townspeople in most cities looked down their noses at sewage works operators? We've come a long way and it's fellows like Dave Backmeyer who have helped!

* * * *

From the man who invented the slogan "Blueprint Now," none other than E. L. Filby of K. C. Mo., came the following note after reading the May issue of "Here and There"—"Say, that Marble Cliffs Quarries Co. must be publishing two calendars for 1945, for as I look up I see Your Shining Countenance on the same company's calendar for 1945—show-

For Tight, Flexible Joints Across Streams and Waterways, Use

MOLOX BALL-AND-SOCKET PIPE

Tightening the bolts in a Molox Ball-and-Socket Joint before sliding the length down a skid into the stream.

Where gas, oil, water and other liquids must be conveyed across streams, bays, swamps and sloughs unstable trench conditions make imperative the use of a pipe with flexible joints that remain bottle tight.

Such is Molox Ball-and-Socket Pipe, manufactured by the Mono-Cast centrifugal method. The Molox Ball-and-Socket Joint permits assembly on a barge, or the pipe may be assembled at the shore line and floated across on pontoons. The extreme flexibility of the joint permits a deflection of 15° so the pipe may be slid from the barge or released from pontoons without fear of leaks developing in the joints.

AMERICAN CAST IRON PIPE COMPANY

Birmingham 2, Alabama

Sales Offices in Principal Cities

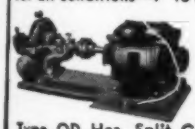
Mr. Engineer:

Meet PUMPS *by Aurora*

Pumps "by Aurora" are well worth knowing — efficient and lasting — sizes for practically all requirements. Built by exclusive makers of fine pumps who regard EVERY pumping job IMPORTANT. Pumps "by Aurora" deliver satisfaction.

NSA Aurora Centrifugal Sump Pump

Aurora Deep Well Turbines for all conditions—4" to 24"



Type AD Hor. Split Case, Two Stage Centrifugal

Type OD Hor. Split Case Double Suction Single Stage Centrifugal

Type G M C Close-Coupled Centrifugal

Apco Turbine-Type Pumps The simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

Type GGU Side Suction Single Stage Centrifugal

APCO Horizontal Condensation Return Unit

APCO Single Stage Turbine-Type

Write for CONDENSED CATALOG M or See Our Catalog in SWEETS.

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

68 Loucks Street, AURORA, ILLINOIS

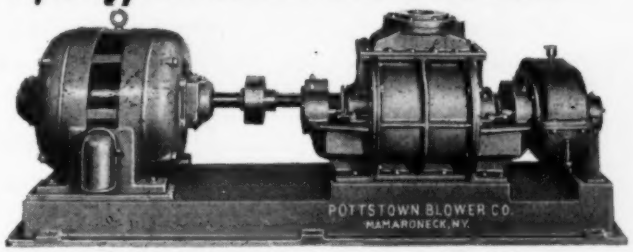
EFFICIENT SLUDGE ACTIVATION *Depends Upon Use of the Proper Air Blower*

Should It Be TURBO OR ROTARY Type?

To be sure of economical operation, low maintenance expense, long service . . . investigate both of the two types of Allen Billmyre Air Blowers. Since we make both types, our recommendations are impartial.

● For Constant Volume at All Pressures

***Specify* POTTSTOWN ROTARY BLOWERS**



Because of their close, accurate impeller clearance, these blowers deliver positive displacement with maximum volumetric efficiency. Friction is eliminated —there are no sliding parts—hence no need of internal lubrication. Less power is required to operate Pottstown Blowers. And their long life in sewage disposal plants has been proven.

● For Constant Pressure at All Volumes

***Specify* ALLEN BILLMYRE TURBO BLOWERS**

These centrifugal type blowers require no pressure, relief or power controls. There are no gears, valves, sliding or reciprocating parts, and no internal lubrication is necessary. Operation is economical, trouble-free. Maintenance costs are minimum.

AB-786

Write today for Bulletins

ALLEN BILLMYRE COMPANY 449 Fayette Avenue, Mamaroneck, N. Y.

ALLEN BILLMYRE

TURBO CENTRIFUGAL TYPE

and **POTTSTOWN**

ROTARY POSITIVE DISPLACEMENT

BLOWERS

BUFFALO ENGINES
ASSURANCE of PROTECTION

THE ANSWER TO...

"What Stand-by Power?"

Assurance of protection is the big thing to any one who buys an engine for emergency power.

FOR over forty years BUFFALO ENGINES have been providing this assurance as stand-by engines in water works, fire and flood control, communications service and industry. Their reliability is proven constantly in thousands of installations. In addition, they offer many other benefits which a study of their specifications will reveal to works engineers and operating managers.

BUFFALO ENGINES deliver their full rated power and run at constant speed, quietly, cleanly and without vibration. Their design is fully developed from long experience, which results in simple maintenance, accessibility of working parts for inspection and adaptability to convenient plant layout.

Write for specification sheets for your file or information on any type of application.

BUFFALO GASOLENE MOTOR COMPANY

DEPT. WW-85 BUFFALO 13, N. Y., U. S. A.

3—RAB-8 BUFFALO Engines used in Flood Control Work—at the Call St. Pumping Station, Chicopee, Mass.

BUFFALO ENGINES — 100 H. P. THROUGH 750 H. P.— IN GENERATOR AND PUMPING SETS FOR WATER WORKS — AIRPORTS — COMMUNICATIONS — FLOOD CONTROL — HOSPITALS — INSTITUTIONS — MINES — MOVABLE BRIDGES — THEATRES — SEWAGE PLANTS.

ASSURANCE of PROTECTION

ing a picture of the Ohio Section AWWA Meeting at Columbus last (1944) Spring—Looks as though you have attained your wish to be a pin-up boy, Doc."

* * * *

Came June 12, and in the mail was a post card showing the Danville, Ill. Public Library, with the note saying "Came to Interstate Water Co. as well as Rotary Meeting to show our movie for Mr. Ell—What do your home town folks need to know about water that we can show 'em? Except a movie?—John E. Klienhenz." Well, that movie John has put together for the Indianapolis Water Co. Public Relations and Educational Program is worth seeing. Within a reasonable area in the Mid-West, I'm sure John would be glad to show the movie for you too, if you'll write him.

* * * *

Wouldn't you know; it's Miami! While other cities boast about their sewage works parks, Miami is going them one better. Its new sewage treatment works and incinerator will be right in the middle of a golf course. Let's see—the settling tanks might make a good water hazard, and a sludge lagoon could serve as a trap that *is* a trap—You just watch, leave it to Miami, they'll take a tip from "Ance" Damoose of Battle Creek and spray the fairways with liquid sludge thereby solving the problem of supernatant liquor and sludge disposal all at one time, and then wait until you read in the travel ads about the fairways that are carpeted with green velvet—Golf courses have been buying sludge and lots of water that's just plain water for years, so maybe this idea isn't as crazy as it sounds.

* * * *

From the mail bag—"Dear Doc: Was intrigued by your postal advising me to look on Advt. page [illegible] of your current issue for an item of interest to me. In endeavor to carry out your suggestion I looked for the issue of **W.W.&S.** but found it had not yet arrived. Does this mean that Uncle Sam has failed in his duty as a mail carrier or that you got up early some morning and have more than caught up with your work schedule? Sincerely, Charlie (Emerson)". Without wishing to cast any aspersions on Uncle Sam's Postal boys who haven't had a raise in years and years—but Charlie, did you ever know a fellow, with low blood pressure, who had caught up with his work schedule?

* * * *

An editor, reporter, or columnist may "knock himself out" producing

some literary effort and the cash customers never so much as murmur, but let him make a mistake and some eagle-eyed reader is bound to point out the lapse of the writer into conversational colloquialism, grammatical error, or a misspelled word.

For example, there was the man who called attention to my misuse of the work "like" in place of "as." And there was the letter which arrived recently from one Maj. Rolf Eliassen, with this notation on the back of the envelope, to wit: "My regards to purest Symons on p. 205, June 1945 issue,—must be a superlative of purist—RE."

Must be indeed!

MANUFACTURERS' and EQUIPMENT NEWS

Hooker Executives Advanced

Hooker Electrochemical Co. has announced the election of H. M. Hooker, its former president, as chairman of the board and E. R. Bartlett, former executive vice-president, as its new president.

Harry M. Hooker

Edwin R. Bartlett

Harry M. Hooker, a graduate of the University of Rochester, has been associated with the company since 1913 at which time he served as superintendent of construction. He became sales manager in 1918 and in 1922 was elected vice-president in charge of sales and at the same time was appointed to the board of directors. In 1938 he suc-

IT'S TIME TO *Design* FOR LOW CHEMICAL COSTS

Plants now under construction and many still in the blueprint stage look to economies in water treatment by designing for the N-Sol Processes of water coagulation. Their choice is based on the high quality water produced by N-Sol Processes plus these definite savings:

1. Time saving in settling.
2. Higher rates of filtration and longer filter runs.
3. Lower costs for coagulant chemicals.

The choice of four processes permits use with any sterilization method. Before you blueprint, know more about the N-Sol Processes. A handy data file, containing reprints and bulletins, free on request.

Four processes fit any water treatment method—save space, save money.

N-Sol-A*—N Brand reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B—N Brand reacted with alum. Used with any sterilization procedure. (U. S. Pat. No. 2,310,009)

N-Sol-C*—N Brand reacted with chlorine. Used with any chlorine sterilization.

Baylis Sol—N Brand reacted with sulphuric acid. Used with any sterilization procedure. (U. S. Pat. No. 2,217,466)

* Patent Applied For.

N-SOL PROCESSES FOR WATER COAGULATION

DEVELOPED AND PATENTED BY
PHILADELPHIA QUARTZ COMPANY, PHILADELPHIA 6
AVAILABLE UNDER LICENSE WITHOUT CHARGE

ceeded his brother, the late Elon Huntington Hooker, as president of the company.

Edwin R. Bartlett was graduated from Dartmouth College in 1904. His association with the company began in 1907 with the Development and Funding Company, which later became the Hooker Electrochemical Company. He has held various positions with the company becoming a director in 1925 and in 1935 being elected vice-president and works manager. He has been executive vice-president since 1941.

Carbides New Lubricant

A new internal combustion engine lubricant having unusual advantages, particularly for cold weather use, has been announced by Carbide and Carbon Chemicals Corp., a Unit of Union Carbide and Carbon Corp. This lubricant, now being produced in commercial quantities, has properties quite different in many respects from oils derived from petroleum.

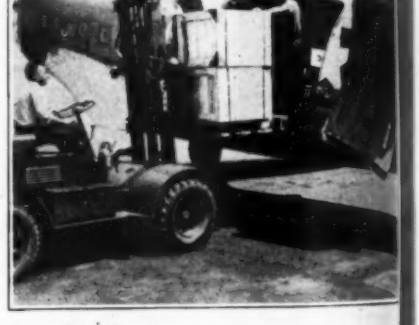
The lubricant can be manufactured to any desired viscosity and is wax free. Pour-points vary from —30 to —80°F. Flash points range from 300°F. up. The new materials have densities approximating that of water. Carbon residue values are less than 0.01 per cent, regardless of viscosity. The lubricant is characterized by low change of viscosity with change in temperature, having viscosity indices in the range of 140 to 160.

The new lubricant contains no petroleum oils and is manufactured in two types, water soluble and water insoluble. The latter is used in internal combustion engines. It has been studied for several years in a large number of vehicles which have covered a total of over one and one-half million road miles. Large quantities are being used in military equipment, and at the present time, sale of the lubricant is restricted to war uses.

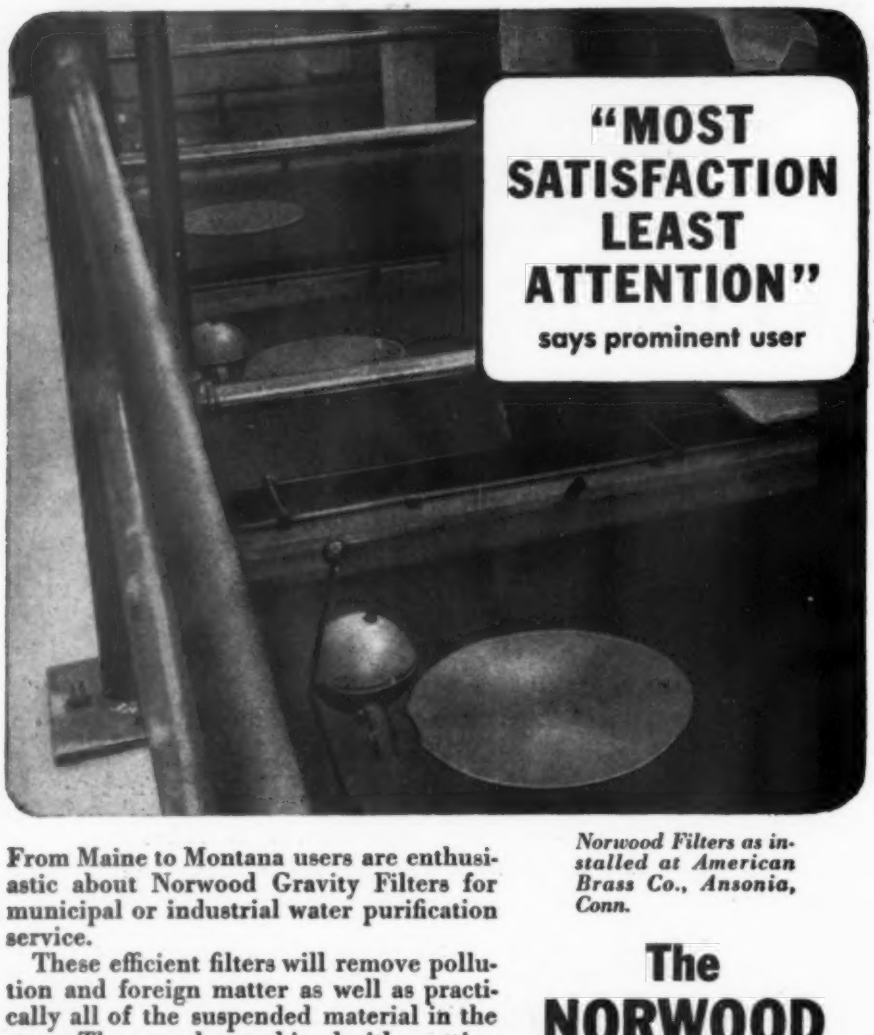
These new lubricants practically eliminate sludge and varnish formation in the engine. Wear of the moving parts is in line with wear experienced with ordinary mineral oils. Ease of starting in cold weather is an outstanding advantage.

More Airborne W.&T. Chlorinators

12,000,000 gallons a day is a lot of water—it is enough to supply a city the size of Trenton, N. J., yet that is the amount needed in India to meet minimum requirements in



preventing the spread of water borne disease. Under the direction of the U. S. Army Corps of Engineers, New York District, Wallace & Tiernan Co., Inc., shipped by Army Transport Command planes to India enough chlorinating equipment to supply 12 mgd. of safe water. This again demonstrates the precedence given by the Army to safe drinking water.



Norwood Filters as installed at American Brass Co., Ansonia, Conn.

From Maine to Montana users are enthusiastic about Norwood Gravity Filters for municipal or industrial water purification service.

These efficient filters will remove pollution and foreign matter as well as practically all of the suspended material in the water. They may be combined with aeration and automatic chemical treatment to remove odors, color and objectionable chemical content.

Fifty years of specialized experience back every Norwood filter installation, yet latest engineering features make them modern as tomorrow.

Municipal or industrial officials, consulting or waterworks engineers are invited to ask our help on any water filtration problem, now or postwar.

W-1

The NORWOOD
ENGINEERING COMPANY
25 N. Maple St.
Florence, Mass.

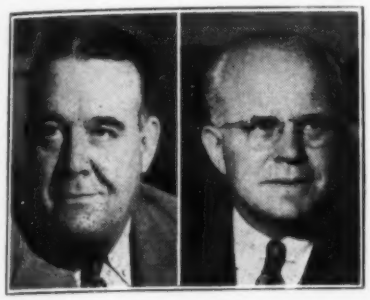
The Best For Your Money
NORWOOD FILTERS
In The Long Run

When the New York District Engineers advised Wallace & Tiernan of the need for this rush shipment, extra production and diversion from other contracts made the required units available on schedule. They were delivered to the Army at an Eastern Air Field where the entire shipment of Portable Water Chlorinating Units, was packed in ATC planes for direct air transport to India.

Gardner New Gen. Sales Mgr., Byers

Rowland, Asst. Sales Mgr.

Robert H. Gardner has been appointed general manager of sales of A. M. Byers Co. Mr. Gardner has been manager of Byers' Washington



Robt. H. Gardner H. R. Rowland

office since 1933, except for a four year period ending in 1940 during which he was manager of the company's steel pipe sales, with headquarters in Pittsburgh. He takes over the duties of the late Myron J. Czarniecki, who died June 18. Prior to coming with Byers, Mr. Gardner was assistant sales manager of Caterpillar Tractor Co.

The appointment of H. R. Rowland as assistant general manager of sales has also been announced. Mr. Rowland joined the company's sales department in 1915 and in 1925 became manager of the Pittsburgh division.

Dr. G. E. Miller Joins W. A. Taylor

W. A. Taylor & Co., Baltimore manufacturer of Taylor Comparators for pH, Chlorine and Phosphate Control, has announced that Dr. G. E. Miller has become actively associated with the company. While Dr. Miller was one of the original founders of W. A. Taylor & Co., his duties at Edgewood Arsenal as Technical Adviser to the Command-

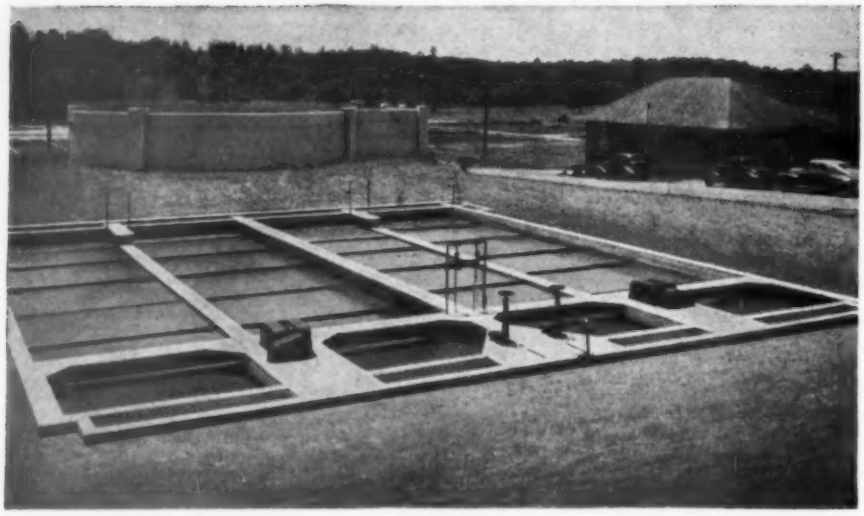
Do you have a problem involving pressure control in 2" to 16" lines carrying water, oil or gas? Does that problem involve a wide drop in pressure—or is it within critical limits of only a few inches of water?

CLAYTON Pressure Reducing Valves may be the answer. Shown above is an installation of 5 Clayton Pressure Reducing Valves on 16" lines which handle a pressure drop from 280 lbs. PSI to 160 lbs. PSI. In other installations, Clayton 16" Pressure Reducing Valves are handling reductions as limited as from 9 inches to 4 inches of water.

Write for Clayton Recommendations to fit Your Requirements. Representatives in Principal Cities.

VALVE DIVISION
CLAYTON
"Feather Touch" CONTROL

CLAYTON MANUFACTURING COMPANY, ALHAMBRA, CALIFORNIA



Look beneath the surface

All rectangular tanks with conveyor sludge collectors are not the same. There are *important differences* in the equipment hidden beneath the liquid surface. To obtain the best in design, efficiency and long life, insist on these refinements which pay dividends for many years after the tank is first filled.

1. Z-Metal Chain. Greatest resistance to corrosion and abrasion.
2. Self-aligning, self-cleaning bearings on through shafts.
3. Offset, split drive sprocket. No cantilevered supporting bracket.
4. Hardened, centralized wearing shoes strengthen scrapers.
5. Full width skimming. Positive concentration of scum.
6. Spring-brass squeegee, needs no adjustment, removes grease deposits.
7. Pivoted flight allows for tank inaccuracies yet assures positive cleaning of tank bottom and corner.
8. Motorized drive units—neat appearing—efficient.
9. Cross collectors—for greater sludge concentration and operating ease.

Only Rex equipment offers all of these features. Specify Rex on your job. Rex engineers will be happy to work with you in the application of Rex equipment to your conditions. Let them show you what Rex can do for you—no obligation of course. Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.

Blueprint Now!

REX **SANITATION EQUIPMENT**

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers Aero-Filters • Rapid Mixers • Grit and Sludge Collectors and Grit Washers

CHAIN BELT COMPANY OF MILWAUKEE

Member of the Water and Sewage Works Manufacturers Association, Inc.

ing General, Technical Command, left him little time to devote to the company he helped to form.

Dr. Miller brings to the Taylor staff an unusual background in organic chemistry combined with a wide practical experience in its applications to industry and various Government agencies.

In October 1920, he was appointed Research Chemist at Edgewood Arsenal and during the next 20 years was advanced first to Chief of the Organic Department, then Chief of the Chemical Division and finally, as Technical Adviser to the Commanding General, Technical Command, a post he resigned in April, this year, to become actively associated with W. A. Taylor & Co.'s staff of technicians.

Chris Bingham Now With Va. Smelting

Chris F. Bingham, former district sales manager of the Columbia Chemical Division of Pittsburgh Plate Glass Co. has been appointed manager of the industrial sales department of the Virginia Smelting Co., West Norfolk, Va. Mr. Bingham, formerly Supt. of Filtration at Richmond, Va., and "wheel-horse" in the Va. section of AWWA, is author of the article on "Practical Aspects of Handling Chlorine," which appeared in the June 1945 Reference and Data Number of *Water Works and Sewerage.*

Dorrco D-I System

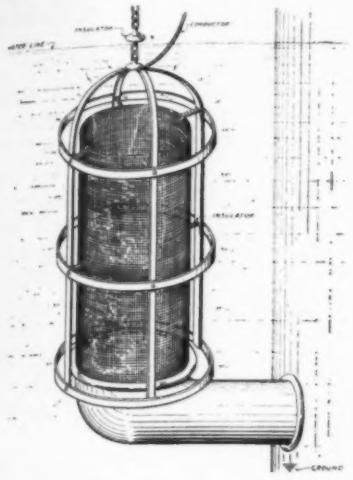
A compact unit to "make water to order" embodies the Dorr Co. Deionization System. The unit will deliver mineral-free water, chemically equivalent to distilled water in purity, and the output may be regulated to the exact degree of softness or mineral content required for any specific use.

Operating under commercial conditions, this system has yielded water at from 2 to 20 cents per 1000 gal., depending on the mineral concentration of the raw water. This cost is much lower than the $0.65 to $8.00 for distillation costs of similar waters.

Units are now available for volumes from a few gallons to millions of gallons of water a day. Simple controls affect the passage of raw water through the first stage where calcium, magnesium and sodium (if desired) may be removed, and then passage through an anion exchanger to remove the acid resulting from the first stage. Silica free exchange material of high mechanical and chemical stability make possible long runs between regenerations. Additional information is available from The Dorr Co., 570 Lexington Ave., New York, N. Y.

Burkey Electric Fish Screen

In our Dec. 1944 issue, we ran a news item on a Burkey Electric Fish Screen, showing therewith one of the models. Herewith is another style of screen for intakes.



This electric fish screen consists of but three simple parts, the electronic impulse generator, live electrodes suspended over and insulated from a screen which acts as a ground. The circuit is completed through the water as a conductor. The electrified zone of water is enough to discourage any fish without harming it.

By means of the Burkey Electric Fish Screens, fish planted in lakes and streams may be saved from destruction through irrigation canals, mill races, intakes, and polluted areas. This new piece of equipment promises to be a scientific aid in fish conservation. These screens are produced in Hollywood, by the Electric Fish Screen Co., of 1130 N. Poinsetta Place.

Cam-Stat Controls

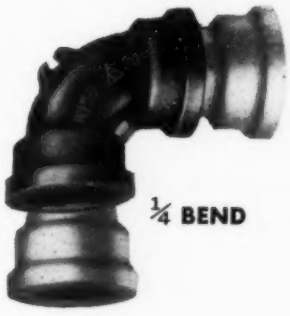
The Paul Henry Co. announces a complete line of control devices embodying a unique snap action ar-

rangement which lends itself to unusually accurate control of Temperature, Pressure, Humidity and Mechanical Displacement. Other features are double break contacts, applicable range from —100 to +600 deg. F.; enclosed contacts; single pole single throw, single pole double throw or independent circuit double throw; resistance to vibration; low thermal lag; tamper proof; adaptability to any mounting means; contact opening from .010 to .060 inch, as desired; operating parts always in balance thermally as well as geometrically; accuracy of calibration not affected by under heat or over heat conditions. These devices are marketed under the name **Cam-Stat.**

Cam-Stat temperature controls are fully adjustable over a wide range and are furnished with operating differentials running down to as low as 1 deg. F. They are small, light, rugged, efficient and can handle substantial loads.

Illustrated herewith is a model C thermostat weighing less than one ounce and rated at 10 amps, 115 V AC or 28 V DC.

Problems or inquiries should be addressed to The Paul Henry Co., Thermal Division, 2037 South La Cienega Boulevard, Los Angeles 34, Calif.



Comparative Weights

	GRINNELL	COMPETITION
4″	70 lbs.	94 lbs.
6″	106 lbs.	140 lbs.
8″	148 lbs.	211 lbs.
10″	216 lbs.	280 lbs.
12″	305 lbs.	366 lbs.

FOR EASE OF HANDLING

it pays to use

Grinnell Socket Fittings

Improved design reduces size and weight

Grinnell socket fittings are easier to handle, fit into close quarters and speed installation because their improved design reduces size and weight. Friction loss is actually reduced. Socket and spigot dimensions and wall thickness are the same as AWWA standard Class D pipe. Approved by Underwriters' Laboratories.

Provided with lugs to take socket clamps. Special coating of coal-tar pitch varnish. Write for catalog, "Water Works Specialties".

GRINNELL COMPANY

EXECUTIVE OFFICES, PROVIDENCE 1, R. I.

Branch Warehouses

Atlanta 2, Ga.
Charlotte 1, N. C.
Chicago 9, Ill.
Cleveland 14, O.
Houston 1, Tex.
Los Angeles 13, Cal.
Minneapolis 15, Minn.
New York 17, N. Y.
Oakland 7, Cal.
Philadelphia 34, Pa.
Providence 1, R. I.
St. Louis 10, Mo.
St. Paul, Minn.
San Francisco 7, Cal.
Seattle 1, Wash.

GRINNELL

WHENEVER PIPING IS INVOLVED

Hill-Hubbell thermostatic control assures a more perfect Bond

What does Thermostatic Control and perfect Bond mean to Steel Pipe Protection?

It means that in order to get a perfect bond free from holidays and imperfections, the process of (1) Cleaning, (2) Priming, (3) and (4) Multiple Coating, (5) Asbestos Felt and (6) 80 lb. Kraft Paper Wrapping must be accurately machine controlled.

Thermostatically controlled and agitated kettles must give positive and correct temperature of enamel at point of application. The Steel Pipe must revolve at proper speed, to assure even distribution of hot enamel. The HILL-HUBBELL process makes the job absolute Steel Pipe Protection.

HILL-HUBBELL Biturine or other standard enamels used in steel pipe protection, is mechanically applied indoors, away from all weather hazards, under positive thermostatic control. Specification TQA-1 is illustrated above.

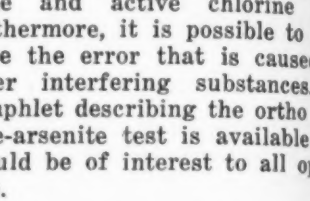
GENERAL PAINT CORPORATION
HILL, HUBBELL & CO. • Division • Cleveland, Ohio
• EXPORT OFFICE SAN FRANCISCO, CALIFORNIA, U. S. A. •

New Series LaMotte Chlorine Comparators and Testing Outfits

As a result of studies on water and sewage chlorination, The LaMotte Chem. Co. has developed a complete new line of Chlorine Control Units. The latest recommendations of the Committee on Control of Chlorination of the American Water Works Association have been carefully followed, and a new series of standards has been prepared of a size interchangeable with the regular LaMotte pH color standards. An additional new development is the ortho tolidine-arsenite test, which makes it possible to measure separately chloramine and active chlorine and, furthermore, it is possible to estimate the error that is caused by other interfering substances. A pamphlet describing the ortho tolidine-arsenite test is available and should be of interest to all operators.

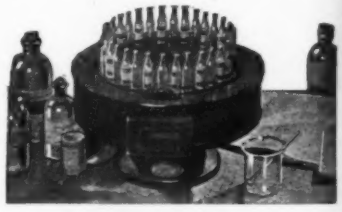
The new and revised equipment includes the following:

1. Chlorine Colorimeter—For low chlorine concentrations, 0.02 to 0.3 parts per million with the standards are prepared in special sealed Nessler Tubes, with polished tops and bottoms.



Chlorine Block Comparator

2. Chlorine Block Comparator (Standard Model) for Medium Chlorine Concentrations 0.1 to 1.0 ppm.
This is a modification of the LaMotte-Enslow Chlorine Comparator that was originally developed with the cooperation of Mr. L. H. Enslow. The arrangement of tubes eliminates any error due to color or turbidity of the sample, such as may be encountered in raw water, sewage and industrial wastes.
3. H-C Chlorine Block Comparator—For high chlorine concentrations, 1.0 to 10.0 ppm., and by dilution of 200 ppm. and above.
4. Wide Range Chlorine Comparator—Range 0.1 to 10.0 ppm. and by dilution to 200 ppm. and above.



Roulette Chlorine Comparator

5. Roulette Chlorine Comparator, with a range 0.1 to 10.0 ppm., and by dilution to 200 ppm. and above. It contains an internal daylight reading arrangement.

Cutler-Hammer Appoints F. A. Wright Ass't Gen. Sales Mgr.

Cutler-Hammer, Inc., of Milwaukee, Wis., have announced the appointment of F. A. Wright as Assistant General Sales Manager. The appointment was made by P. S. Jones, Vice President in Charge of Sales, and is a part of the company's program of personnel organization for post-war activity.

Mr. Wright has been associated with Cutler-Hammer since 1927. He was a member of the company's St. Louis district sales office until 1939 when he was appointed manager of resale sales and joined the Milwaukee headquarters. Since then he has been actively associated with the development and sale of many of the company's outstanding new products, especially motor control items for the machine tool, automotive and aircraft industries.

and all standards are in the revolving drum, permitting the operator to obtain readings in a minimum of time and under uniform light conditions

4. Combination pH and Chlorine Outfits—Special new combination outfits have been designed to contain any selected range of pH and chlorine standards, compactly arranged in a single case. The chlorine color standards are of a size interchangeable with the regular (15 mm.) LaMotte pH color standards.

The LaMotte Chemical Products Co. is located at Towson 4, Md.

Fred Deutsch to Builders-Providence

Fred W. Deutsch is now associated with Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence, R. I., as Assistant Sales Manager.

In his new connection, Mr. Deutsch will be concerned with sales of Builders' well known water and sewage works equipment and also the Company's recording, indicating and controlling instruments as manufactured for industrial applications.

A native of Brooklyn, Mr. Deutsch attended Stevens Institute and has since been actively associated in the municipal and industrial equipment fields. For several years he was connected with the Permutit Co. and later with the Duro Pump Co. In 1940 he joined the Everson Mfg. Co., becoming Vice-President in 1943 and continuing in that office until resigning early in the current year.

Mr. Deutsch will make his headquarters in Providence, R. I.

IMPROVED JOINTING COMPOUND

Tegul-MINERALEAD

for Bell & Spigot Main

- Sulphur base; quick sealing, speeding laying and backfilling.
- 10 lb. ingot form, easily handled, stored and shipped. Impervious to rain. Cannot change composition.
- Makes permanently tight joints. Goes 3 to 5 times as far as lead, helping conserve a strategic war metal.
- For money-saving information, write

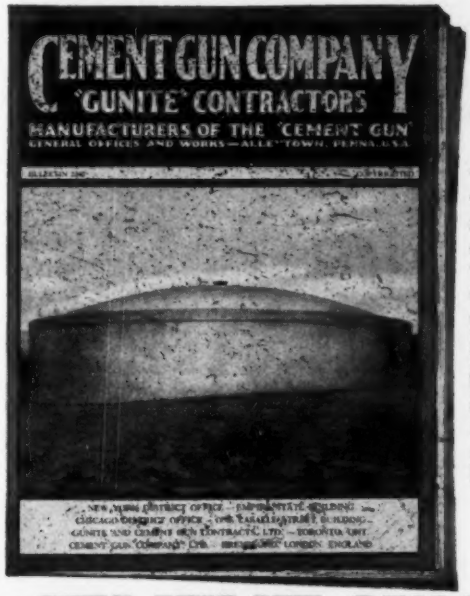
The ATLAS MINERAL Products Company of Pa.
Mertztown Pennsylvania

NEW! 72 page bulletin on...

"GUNITE"

...and how to use it

PROFITABLY



This new Bulletin C2300 is packed with useful information, photographs and drawings. It contains sections devoted to design data and specifications . . . repairs and relining of reservoirs and construction of new reservoirs . . . repairs to bridges, buildings, dams, walls, sewers . . . "GUNITE" linings of pipe, canals, coal bunkers . . . construction of prestressed "GUNITE" water tanks . . . encasement of structural steel and literally scores of uses you may be overlooking.

Write for your free copy of Bulletin C2300 today.

CEMENT GUN COMPANY

"GUNITE" CONTRACTORS

GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

KNOW YOUR SEWAGE TREATMENT PLANT PERFORMANCE. USE INFILCO AUTOMATIC SAMPLERS with refrigeration!

Samplers may be had with manual adjustment of sampling interval or with automatic proportioner control.

Ask for Bulletin 2430

INFILCO

INFILCO INCORPORATED

325 W. 25TH PLACE, CHICAGO 16, ILL.

The TATE Cement Lining Process
Restores efficiency of old Water Mains

Now is the time to investigate the Tate Cement Lining process —and see what it can do to restore the efficiency of your old water mains.

View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Write for Literature.

What the TATE Process accomplishes

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All joints cement-lined . . . just one continuous pipe.
6. Does the job without interruption of service to consumer.

TATE PIPE LININGS, Inc.
ANDOVER, MASS.

84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

New All Purpose Ideal Electric Marker

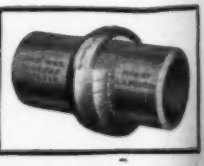
Anything and everything can be marked with the new electric marker recently announced by the Ideal Commutator Dresser Co., 1615 Park Avenue, Sycamore, Ill. Only six inches long and ten ounces in weight, this new marker, which uses an entirely new principle and design providing increased power in its cutting

stroke, may be used continuously on all types of marking jobs. Operating from any AC electrical outlet on the principle of the small electric hammer, it makes 7,200 cutting strokes per minute. The marker is available with either diamond or alloy point and may be obtained directly from the Ideal Commutator Dresser Co.

Ucilon Protective Coating

Ucilon, a synthetic resin plastic produced by the United Chromium Corp., is a new surface coating material that will resist corrosive conditions. The resin is air drying and may be applied by brushing, spraying or dipping. It is not a paint but is applied as a liquid from which the solvent evaporates, leaving a tough

WESTON



GASKET AND FORM
The Perfected Method for Making
Sewer Pipe Joints of Cement

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON Adams, Mass.

resistant coating that has all of the inherent properties of the resins themselves.

When dry the resin is flexible over a wide range of temperatures but is not recommended for temperatures above boiling. Ucilon coatings adhere to wood, metal and concrete. They are resistant to abrasion, unaffected by oils, gasolines and alcohols, acids, alkalies and salts, and will impart no taste or odor to foods or water.

Ucilon is available in white, black, gray, green and clear. With the properties mentioned, it should find application in water and sewage plants. We believe it would be worth the experiment to ascertain whether or not Ucilon will stand up in sedimentation tanks, both water and sewage, or in digestion tanks, in chemical tanks, or on piping or a dozen other places where a good corrosion resisting coating is needed to protect equipment in water and sewage plants.

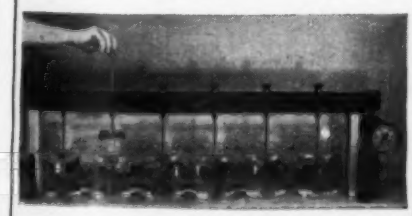
For further information on this new product write to United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y.

Worthington Makes Feldbush V.P. in Charge of Engineering

Harry A. Feldbush, formerly Works Manager of the Holyoke, Mass. plant of Worthington Pump and Machinery Corp. has been named Vice President in charge of Engineering for the entire Corporation. His duties cover engineering activities of all works and domestic subsidiary companies. His headquarters will be at the general offices in Harrison, N. J.

Ralph M. Watson, formerly chief engineer of the Centrifugal Engineering Division has been appointed Assistant to Mr. Feldbush.

THE *Phipps & Bird*
LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

OPERATING VALVES WITH DEAN OPERATING MACHINE

"Power take-off from truck motor makes short order of this otherwise laborious and time consuming job."

The above statement was made by Alan D. Drake, Director, Division of Water, Buffalo, N. Y., in an article in the April 1945 issue of Water Works and Sewerage.

RENSSELAER VALVE CO. **TROY, N. Y.**

for HIGHER efficiency

ISCO

AND LOWER VACUUM FILTRATION COSTS

Ferri-Cl$_3$OR
Ferric Chloride
The FAST Coagulant

THE MODERN AND EFFICIENT COAGULANT

Write for further information

FERRIC CHLORIDE

INNIS, SPEIDEN & CO.
Established 1816
117 Liberty Street New York 6, N. Y.
BRANCHES • CHICAGO • CLEVELAND • PHILADELPHIA • BOSTON • GLOVERSVILLE, N. Y.

Leopold

GLAZED FIRE CLAY TILE FILTER BOTTOM

Non-Corrosive—Permanent

DRY CHEMICAL FEEDERS

Accurate—Dependable

also

COMPLETE WATER TREATMENT EQUIPMENT

F. B. LEOPOLD CO., INC.

422 FIRST AVE. PITTSBURGH 19, PA.

Over 225 P.F.T. Floating Covers in War Service

The health of our fighting men and war workers is being safeguarded by modern sewage disposal plants. We are doing our part by delivering on time P.F.T. Floating Covers and other sewage treatment equipment.

The P.F.T. Floating Cover for single and stage digestion hastens the digestion process, and provides for utilizing the sewage gas to heat water for the digester tank.

Catalog No. 232 contains complete information, including specifications. Write for your copy.

P.F.T. PACIFIC FLUSH-TANK CO.
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C.

INSTALLATIONS WORLD WIDE — LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS LATEST "COREY TYPE" HYDRANTS

Write for Catalogue and Information

IOWA VALVE CO.

General Offices:
Hubbell Bldg., Des Moines, Iowa

Plants:
Oskaloosa, Iowa

LL.D. Degree to E. L. Oliver

On June 23rd at the commencement exercises, the University of California bestowed the degree of Doctor of Laws (LL.D.) on Edwin Letts Oliver, President of Oliver United Filters, Inc.

The citation accompanying the award to Doctor Oliver reads as follows:

"Graduate of our College of Mining in the class of 1900; noted for his invention of the filter bearing his name; one whose activities have been carried on not only in the United States but in other lands as well; man of far-flung interests, resting on the foundation of his own inventive genius."

This degree is a fitting award to a man who has contributed so much to industrial progress.

Crane Advances Sales and Branch House Personnel

Crane Co. has announced the following changes in its Sales and Branch House division: Carter T. Pollock, formerly manager of Crane's Chicago Branch, has been appointed manager of the Central District with headquarters in Chicago; W. A. Burbine, formerly manager of the company's Cleveland branch, becomes manager of the Chicago Branch; A. N. Rosborough, formerly manager of the Toledo Branch, appointed manager of the Crane branch in Cleveland; W. D. LaRue, manager of the Muncie, Ind., branch, becomes manager of the Toledo branch; and R. C. Danielson, formerly manager of the Plumbing Department at the Indianapolis branch, succeeds Mr. LaRue as manager of the Muncie branch.

WATER MAINS DISINFECTION:

We provide chemicals, equipment, and experienced operator ready to serve you within 200 miles of Washington, D. C. Write or telephone us for information.

LUTHER and WOOD

310 Chandler Building
Washington 5, D. C.
Telephone National 2123

ANTHRAFILT

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York

H. G. Turner Research Engineer
STATE COLLEGE, PA.

Homestead Valve Appoints Sales Managers

The Homestead Valve Manufacturing Co. of Coraopolis, Pa., has announced the appointment of Don H. Krey as Sales Manager, and Elliott G. Johnson as Assistant Sales Manager. Mr. Krey will direct all phases of the company's sales efforts, including Valves, Hypressure Jenny Steam Cleaners, and Hypressure Jenny Compound sales, and research. Mr. Johnson will supervise all valve sales activities in addition to retaining his duties as Director of Advertising and Public Relations.

Bronkie Joins Victaulic

The Victaulic Co. of America has announced the appointment of Willis Bronkie to the engineering and sales staff of that organization.

A graduate of Yale University School of Engineering, 1933, Mr. Bronkie began his career with the Anaconda Copper Mining Co. in Chile, S. A., as Asst. Mine Foreman. His work thereafter has included Canada, with the International Nickel Co., National Lead Co., Tahawus, N. Y., as Mine Supt., Ingersoll-Rand Co., and government service with the Foreign Economic Administration in Brazil as superintendent of equipment and maintenance. Mr. Bronkie will make his headquarters in the main office of the Victaulic Company of America, 30 Rockefeller Plaza, New York City.

AMERICAN GAS BOILERS
STEAM AND WATER TYPES
FOR DIGESTER HEATING
SEE DATA PAGE IN ANNUAL REFERENCE SECTION
AMERICAN RADIATOR & Standard Sanitary
New York CORPORATION Pittsburgh
SALES OFFICES IN ALL PRINCIPAL CITIES

'BESTOLIFE
LEAD SEAL
JOINT SEALING
AND ANTI-SEIZE
PIPE JOINT COMPOUNDS

'BESTOLIFE Compounds have been used successfully for years in Water Works and Sewerage plants.
They obtain their effective anti-corrosion sealing characteristics from the metallic lead base of the compounds.
Use 'BESTOLIFE Compounds on water, oil, gas and gasoline lines; all threaded connections in valves, hydrants, pumps, engines, air compressors, etc., and on all studs and bolts. Also recommended for meter repairing.

Manufactured Exclusively By
I. H. GRANCELL
MIRAMONTE AND EAST NADEAU ST.
LOS ANGELES 1, CALIFORNIA
EXPORT: THE NATIONAL SUPPLY CORP.

HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
New York, N. Y.

DRY BRAIDED
Fibrex

BAILEY METERS AND CONTROLLERS
FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

BAILEY METER COMPANY
1672 IVANHOE ROAD • CLEVELAND, O.
Bailey Meter Co. Ltd., Montreal, Canada

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries
ROBERTS FILTER MANUFACTURING COMPANY • Darby, Pa.

do your plans call for a gravimetric feeder?

Specify an OMEGA "LOSS-IN-WEIGHT"

Without a doubt, the most accurate type of chemical dry feeder . . . weighs, feeds and records within 1% of rate set on feed dial, bringing laboratory accuracy to plant scale treatment. Successfully handles Ferrisul and such hygroscopic chemicals. Write for Bulletin.

Omega "Loss-in-Weight" Gravimetric Feeder

OTHER OMEGA PRODUCTS

Volumetric Feeders
Solution Feeders
Lime Slaking Equipment
Mechanical Agitators
Bucket Elevators
Laboratory Stirers

Bulletins on Request

Sincerely

OMEGA MACHINE CO.
(Division of Builders Iron Foundry)

9N CODDING ST., PROVIDENCE 1, R. I.

F. V. Sohle Moves

F. V. "Vic" Sohle has announced a new office location at 315 Construction Bldg., Dallas 1, Texas. Mr. Sohle is the Southwestern representative for R. D. Wood Co. and for Northrop & Co. He is well known throughout the southwest and for his work in the Southwestern Section of AWWA.

LITERATURE AND CATALOGS

We're a sucker for anything entitled Facts About This or That, so you may well imagine that we looked twice at **Facts You Should Know About Centrifugal Pumps and Impellers.** While this 20-page booklet issued by the Deming Co. of Salem, Ohio, was written primarily for distributors, dealers, and salesmen of the Deming Co., it is far more than a salesman's handbook. It is a textbook on principles of centrifugal pumps; it applies to any centrifugal pump, and it contains information that is of value to any person operating a centrifugal pump.

Beginning with a fundamental hydraulic law and ending with a diagram of the essentials of a side suction pump with semi-enclosed impeller the booklet is crammed with information on various types of side suction pumps, impellers, double suction pumps, hydraulic balance, mechanical balance, split case pumps, and explanations of impellers and the various styles thereof. Quite an education available to you there, just for the price of a postage stamp on a letter asking for it.

SAVE with TENNESSEE CORPORATION Ferri-Floc FERRIC SULPHATE

Write today for actual case histories of plants now using the ideal ferric coagulant.

TENNESSEE CORPORATION
Atlanta, Georgia Lockland, Ohio

· 1879 ·
ROSS
AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs, hydraulic control.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.
4. Can be equipped with electric and manual controls.

COMBINATION VALVE
This valve will permit flow in one or both directions acting as
1. Pressure Reducing and Relief Valve.
2. Pressure Reducing and Altitude Valve.
3. Relief and Altitude Valve.

REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

EDDY

FIRE HYDRANTS AND VALVES

WATER WORKS EQUIPMENT

EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

EDDY FIRE HYDRANTS
For Fire Protection Service

Write for Complete Catalog

Eddy
VALVE COMPANY
WATERFORD N.Y.

As we have told you before, one of the things that rates high in the interests of our readers is the subject of corrosion and particularly how to prevent it. One of the best ways to prevent corrosion is to use corrosion resistant materials, so to be helpful to persons with corrosion problems, Crane Co. of 836 So. Michigan Ave., Chicago 5, Ill., has issued a **Guide to the Selection of Corrosion-Resistant Piping Materials.**

Prepared by L. G. Vande Bogart, Research Engr. of Crane Co., this chart shows which metals (Iron and Steel, Ni-Resist Cast Iron, 18 8 Mo, Monel Metal, Nickel, Red Brass, Acid-resisting Bronze, and Aluminum) can be successfully used, which should not be used, and which should be used with caution in some 160 solutions, or liquids ranging from acetate solvents, through carbon dioxide, ferric sulfate, and natural gas to water, and zinc salts.

The chart uses four colors: green indicates successful use, red means not to be used, orange indicates caution, and white shows that there is no information available. This useful reference should be filed where it may be found, in every water and sewage plant.

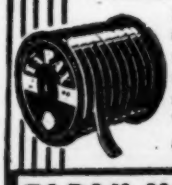
* * * *

For a long time now, we have been glibly conversing with engineers and operators on the subject of power factors of motors, etc. Now, we have found out what we have been talking about, for we have just seen **The A-B-C of Power Factor,** a 20 page booklet that explains power factor in detail. This booklet is an issue in the *E-M Synchronizer,* published by the Electric Machinery Mfg. Co., East Minneapolis 13, Minn.

To begin with, the book explains what power factor is, and how it is

TAPAX

The ORIGINAL *and* FINEST....



Manhole Cushion U. S. Pat. No. 2,050,050 offers you the simplest solution for noisy, rattling covers. Easy to install. Lasting — Economical.

Write for story of Tapax and Trial Offer.

TAPAX MFG. CO., INC.
MAMARONECK NEW YORK

Keep Your Public Happy with Clear Palatable WATER

Hydrodarco, the quality activated carbon, is made specifically for use in water works plants. It does the job in removing by adsorption odors and bad-tasting impurities.

Properly used, you can bank on the results that Hydrodarco gives.

HYDRODARCO
REG. U.S. PAT. OFF.

DARCO
CORPORATION

60 East 42nd Street, New York 17, N. Y.

Distributing Points: New York, N. Y. • Buffalo • Cincinnati • Chicago • St. Louis • Kansas City • San Francisco • Los Angeles • Marshall, Texas

MORE WATER —LESS WORRY

by CLEANING your WATER MAINS using The NATIONAL METHOD

No need to worry about reduced water main capacities just when you need every gallon you can pump. Do as many other communities — large and small — are doing: clean those old clogged up mains by using the NATIONAL METHOD of water main cleaning.

We offer you (1) greater volume of water; (2) lower pumping costs; (3) improved pressure; (4) cleaner water and (5) reduced insurance rates.

Before Cleaning

★ The NATIONAL METHOD

After Cleaning

GUARANTEED TO RESTORE 95% ORIGINAL CAPACITY

The National Water Main Cleaning Co.

30 Church St. Branches: New York 7

1221 Mortgage Guarantee Bldg., Atlanta 3, Ga.
607 First Nat'l Bank Bldg., Birmingham, 3 Ala.
115 Peterboro St., Boston 15, Mass.
205 West Wacker Dr., Chicago 6, Ill.
P. O. Box 683, Jacksonville 1, Fla.
3707 Madison St., Kansas City 2, Mo.
2028 Union Ave., Montreal 2, Can.
3812 Castellar St., Omaha 5, Neb.
210 E. Franklin St., Richmond 19, Va.
7103 Dale Ave., St. Louis 17, Mo.
501 Howard St., San Francisco, Calif.
P. O. Box 887, Waco, Texas
576 Wall St., Winnipeg, Can.

WRITE FOR INFORMATION

VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO. INCORPORATED LOUISVILLE, KY.

MAIN AT 14th

VOGT

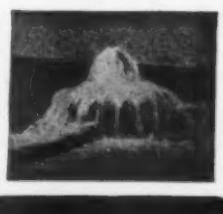
VOGT MFG. CO., Incorporated

P. O. BOX 1122 LOUISVILLE, KY.

AERO-MIX

AERATOR—MIXER

A Size and Type to Fit Your Problem In Water or Sewage Treatment.



WRITE FOR INFORMATION

TYPE X SINGLE LID Meter Box COVERS

These modern covers for water meter settings have the Lifter Worm Lock plus a hinge-effect feature which permits the lid to be leaned back for meter reading, or lifted off if desired. Made in several sizes and depths.

Write for catalog now.

FORD

Meter Box Co.

WABASH, INDIANA

related to various A-C loads; then there is a section on why low power factors are detrimental, and another section on how to get a high power factor. There are also sections on how to make power factor calculations, (we skipped over that) and methods of determining power factors, as well as some handy tables, and a discussion of synchronous motors, why they do double duty and where to use them. Believe us, if we were running a pumping station, or other part of a water or sewage plant where electric motors are used (and we all know a myriad of places where they are) we certainly would write to Electric Machinery Mfg. Co. for this booklet, and study it thoroughly.

* * * *

If the theory of advertising is to create in the consumer a desire to own, then the folder about the **Ideal Rechargeable Flashlight Battery** is good advertising, for we certainly have developed the desire to have one or two around the house.

This folder tells about the three plate battery that has 40 per cent more discharge capacity, gives brighter and more sustained lighting, and is used in place of two ordinary flashlight 1¼-in. size D dry cells.

The cell charger fits any light socket, and there is also a charger that can be put in your automobile or truck. The battery will last several hundred discharges and for normal service this may be as long as three years. According to the folder, which you may obtain from the Ideal Commutator Dresser Co., of 1286 Park Ave., Sycamore, Ill., there are many thousands of users in industrial plants throughout the country.

..for ACCURACY and TROUBLE-FREE OPERATION

INSIST ON THE **WILSON** HYPO-CHLORINATOR

Engineered and Manufactured by

WILSON

CHEMICAL FEEDERS, INC.

203 CLINTON STREET BUFFALO 4, N. Y.

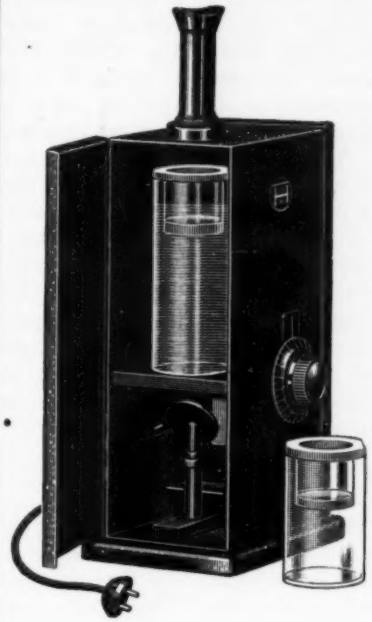
There is no doubt that our readers will be interested in **The Iron Worker,** published by the Lynchburg Foundry Co., of Lynchburg, Va. We were especially interested when we saw the Summer Issue—1945, with its cover picture of a huge cast iron pitcher of artistic Grecian proportions, pouring out pure mountain water conveyed from the Blue Ridge Mountains 21 miles to Lynchburg's College Hill Reservoir, through 36-in. cast iron pipe manufactured by LFC. The inscription on the pitcher reads "Made by the Glamorgan Company, Lynchburg, Va., October, 1890." The founder of the Lynchburg Foundry Co. was president and gen. mgr. of the Glamorgan Co. when the pitcher was cast.

Although there is little else in this particular issue about water works castings, the cover picture alone makes **The Iron Worker** worth writing for. Most issues contain considerable matter of interest to water and sewage works men. **The Iron Worker** was first published in 1919, but was suspended for a period and resumed in 1942.

* * *

It's a funny thing, how long a mistaken idea can stay with one in spite of knowledge to the contrary. For a long time whenever we heard the name of Infilco, we thought only of artificial zeolite water softening systems. Actually, of course, Infilco Inc. of 325 W. 25th Place, Chicago 16, Ill., make and sell many other items in the sanitary engineering field.

For example, there is the **Infilco Rate-of-Flow Indicator,** for which a new bulletin, **No. 1070** has been recently issued. This bulletin shows by diagrams the principles and operation of both the venturi type



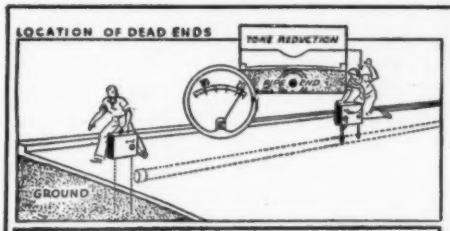
HELLIGE TURBIDIMETER

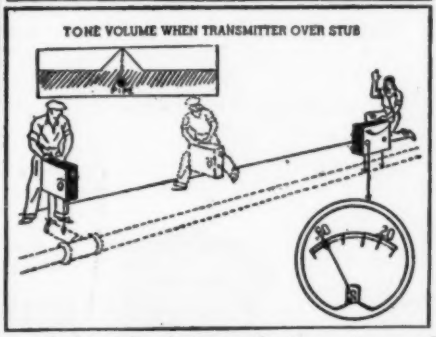
Turbidity measurements (SiO_2), and sulfate determinations (Hellige-Betz method) can be made with greater simplicity, speed and exceptional accuracy. The use of standard suspensions and their tedious preparation are entirely overcome. Reads all turbidities down to zero-turbid water.

Write for Bulletin No. 602

HELLIGE, INC. 3718 NORTHERN BLVD. LONG ISLAND CITY, N.Y.

HEADQUARTERS FOR COLOR STANDARDS AND COLORIMETRIC APPARATUS





M-SCOPE

Buried Pipe Finder and Leak Detector

FREE 16 PAGE BOOKLET UPON REQUEST

The M-SCOPE consists of a specially designed radio Transmitter and Receiver, with conductive wire. In operation, the Transmitter sends out a continuous signal, and when there is no metal between Transmitter and Receiver, a definite volume of sound is heard in the Receiver earphones and the meter (mounted on Receiver) gives a definite reading. If a metal object lies between the two units, sound in earphones is louder and meter reading higher—and the pipe or other metal object is located.

The M-SCOPE is solving — successfully — the varied problems involved in the development, operation and maintenance of buried pipe and cable systems and is in daily use by representative organizations in such important groups as:

- **Government Projects**
- **Municipalities**
- **Sewerage and Water Plants**
- **Consulting Engineers**
- **Airports**
- **Public Utilities**
- **Industrial Plants**
- **Oil and Pipeline Companies**

Write for further particulars and booklet:

FISHER RESEARCH LABORATORY

Direct Teletype PALO ALTO, CALIFORNIA

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.

Sales Office 140 Cedar St. New York, N. Y. Factory Medford, N. J.

Pioneer Producer of GREENSAND ZEOLITE MINERAL

Empire
Oscillating Piston Meters

Performance Proved *Since* **1884**

PITTSBURGH EQUITABLE METER CO.
PITTSBURGH 8, PENNSYLVANIA

CONTACT

LAKESIDE ENGINEERING CORPORATION

Chicago 6 **Illinois**
222 West Adams St.

FOR

WATER SOFTENING by the Zeolite or Lime-soda methods.

WATER FILTERING to remove Suspended solids, color, odor or taste.

SEWAGE TREATMENT by the Aero-filter which offers all of the advantages of other types of trickling filters plus better momentary distribution.

Spiraflo Clarifier for improved clarification, including scum and oil removal.

and the orifice type of indicators, which may be used to indicate flow in one or both directions.

For another example, there is the **Accelo-Filter** described in Bulletin **No. 6200,** describing "Direct Circulation,—A proven method in the treatment of sewage for improving efficiency, eliminating nuisances and increasing the capacity of a biological filter." This 12-page bulletin is replete with flow diagrams, pictures, and charts showing the why and wherefore of this type of treatment with this type of filter.

When you write to Infilco for either of these bulletins, mention our name; they'll be glad to know where you saw reference to these bulletin nos. 1070 and 6200.

* * *

We recently ran an article on trenching for water and sewer lines and know that the article found reader interest. For that reason we thought you might be interested in a copy of the **Bay City** catalog "L," which shows, with a minimum of text, shovels, cranes, clam shells, dragline and hoe models, etc. If you are interested write to Bay City Shovels, Inc., Bay City, Mich.

* * *

According to an article reprinted from the *National Provisioner* in **The Josam News Digest** for June, the Army messes have salvaged more than 20,000,000 lb. of cooking fats in 1944. Valued at $3,300,000, these fats were used and re-used in Army kitchens until spent and then sold for more than $1,000,000 to renderers. At the same time more than 8,000,000 lb. of trap grease was recovered from the messes and sold for $182,000.

SAVE MONEY USE ACTIVATED ALUM and BLACKALUM

STUART-BRUMLEY CORP.
516 North Charles St.
Baltimore Maryland

WHY WATER WORKS ENGINEERS SPECIFY

Taylor
LIQUITROL

THE MODERN METHOD TO CONTROL pH, CHLORINE AND PHOSPHATES

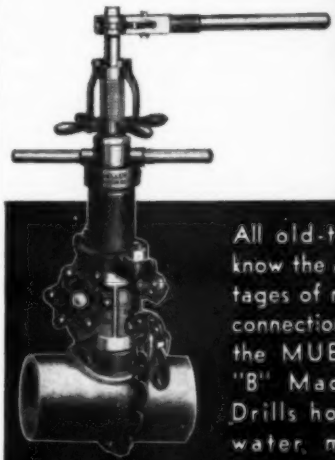
Water works engineers adopted it because it is a scientifically accurate method of determining the exact pH, chlorine and phosphate values in water. These engineers depend on the efficiency of the one complete Taylor unit that meets *all* their requirements . . . no special facilities or accessories are needed.

Taylor Comparators for quick, easy and accurate determinations are priced from $16.00 up, with all Taylor Liquid Color Standards guaranteed against fading. Sets are molded from durable plastic for long life. Send for *free* 84-page book of facts about pH, chlorine and phosphate control, procedures and descriptions of all Taylor outfits.

See your dealer or write direct to—

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE 4, MD.

Saves time



All old-timers know the advantages of making connections with the MUELLER "B" Machine. Drills holes in water mains, taps them, and inserts or removes corporation stops. All under pressure, too! No water shut-off, no trouble, no muss. Saves time also. Your men will like it. They can make better connections. Sizes ½" to 1" inclusive. . . . Write us today.

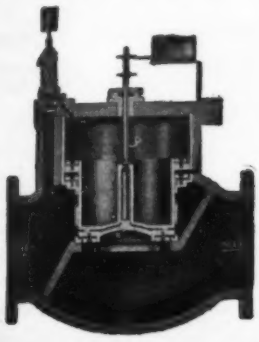
MUELLER CO. FOUNDED 1857
DECATUR 70, ILL. LOS ANGELES 23, CALIF.

Electric Double Cushioned Check Valve

This valve is for use in connection with remote tank storage service with valve located adjacent to motor centrifugal pump, also where a high-low pressure or float-operated switch located at tank is wired to the valve in order to accomplish complete automatic sequence of operation for starting and stopping the pump with respect to storage water levels.

Sizes 3" to 36", angle and globe patterns.

Write for specifications.



GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Some of these trap greases were recovered in traps designed in accordance with the findings of Dawson and Kalinske whose studies and designs are reported in the June Ref. and Data Section of *W. W. & S.* this year.

* * *

Browsing through the **Westinghouse Newsfront** for July, we ran across an item titled "Fence For Fish." Turned out to be a story about the Burkey Electric Fish Screen, which was featured in our Equipment News columns last December—and in this issue another model is described.

EXCEPTIONAL OPPORTUNITY—For a well qualified, practical waterworks man of general all around ability for a new position in our new Machinery Division. In the beginning the work will be principally in the office handling technical correspondence on the Palmer Surface Wash System, the new Overhead Drive Flocculation Equipment, the Adjustable Venturi Throat Distributing Wall, Electronic Water Purifier, Activated Alum, Black Alum, etc. In addition the new position will involve some interesting field work. State qualifications, experience, references, salary. Confidential. Write Stuart-Brumley Corporation, 516 N. Charles St., Baltimore 1, Maryland.

Position Wanted as Sales Engineer. Have thorough knowledge of water and sewage equipment and until taking up war work was in sales field covering Middle West for major equipment manufacturers. Civil engineer with 20 years general practice, 6 years devoted to design and construction. Box 1050, Water Works and Sewerage, 330 S. Wells Street, Chicago 6, Ill.

POSITION WANTED

ARMY AIR FORCE OFFICER—Sales Engineer desires connection with established manufacturer. Army assignments in procurement and development of electronic equipment; pre-war experience sales, service and installations of waterworks and sewage treatment equipment, pumps, flowmeters and industrial instruments. Please reply to Box J. J. L., % Waterworks and Sewerage, 155 E. 44th St., New York 17, N. Y.

LEADITE

The Pioneer Self-Caulking Material for C.I. Pipe

MADE TO MEET A NEED

Even though LEADITE may cost slightly more, it is economical to use, because LEADITE: Is light in weight, meaning less shipping and handling costs. . . . Melts at a low temperature, thus saving fuel and time. . . . Requires no caulking, thus saving more time. . . . Eliminates digging large bell holes. . . . Reduces costs in pumping wet trenches. And Users find LEADITE easy to handle.

Write for Literature

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

ODOR and TASTE are health factors too...

The WATER SUPPLY that pleases nose and palate is an important contribution to community health — people drink more of it.

ESOTOO* is the answer to a simple, sure, and more economical method of controlling residual chlorine — especially in "break-point" chlorination.

ESOTOO* is the Ideal De-Chlorinator.

**ESOTOO is "Virginia's" Trade Name for Liquid Sulfur Dioxide.*

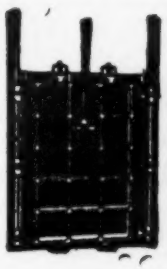
VIRGINIA SMELTING COMPANY
WEST NORFOLK, VIRGINIA

EDSON DIAPHRAGM PUMPS

Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
Strainers and Foot Valves
Hose Spanners—Adapters

THE EDSON CORPORATION
Main Office and Works: 49 D St. South Boston, Mass.
New York: 142 Ashland Pl., Brooklyn

RODNEY HUNT



GATES and HOISTS

Metal or timber sluice gates of all sizes and designs, approved by engineers everywhere. Improved gate stands and hoists for hand or motor operation. Also flap and mud valves, shear and filler gates, trash racks and rakes. Dependable canal equipment from dam to tail-race since 1840.

Write for Special Catalog Today!

RODNEY HUNT

RODNEY HUNT MACHINE CO.
118 Lake St., Orange, Mass., U. S. A.

Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE

ALBRIGHT & FRIEL, INC.

Consulting Engineers

Water, Sewage and Industrial Waste Problems — Airfields, Refuse Incinerators, Power Plants — Industrial Buildings
City Planning - Reports - Valuations

Laboratory

1520 Locust Street, Philadelphia 2

Alvord, Burdick & Howson

Engineers

Charles B. Burdick
Louis R. Howson
Donald H. Maxwell

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

Civic Opera Building — Chicago

Michael Baker, Jr.

The Baker Engineers

CIVIL ENGINEERS AND PLANNERS
MUNICIPAL ENGINEERS

Airport Design—Sewage Disposal Systems
Water Works Design and Operation
Consulting Services - Surveys and Maps

HOME OFFICE—ROCHESTER, PA.

Black & Veatch

Consulting Engineers

4706 Broadway, Kansas City, Mo.

Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports and Laboratory Service

E. B. Black — N. T. Veatch, Jr.
A. P. Learned — H. P. Lutz
F. M. Veatch — R. E. Lawrence
E. L. Filby — J. F. Brown

Clinton L. Bogert

CONSULTING ENGINEER

WATER SUPPLY AND PURIFICATION
SEWERAGE AND SEWAGE DISPOSAL

Timber, Steel and Reinforced Concrete Structures

624 Madison Avenue
New York City 22

Buck, Seifert and Jost

Consulting Engineers

(Formerly Nicholas S. Hill Associates)

Water Supply, Sewage Disposal, Hydraulic Developments, Reports, Investigations, Valuations, Rates, Design Construction Operation, Management, Chemical and Biological Laboratories

112 East 19th St. — New York

Burns & McDonnell

Engineering Co.

McDONNELL-SMITH-BALDWIN-TIMANUS-McDONNELL

Consulting Engineers Since 1897

Waterworks, Light and Power, Sewerage, Reports, Designs, Appraisals, Rate Investigations

Kansas City, Mo., 107 West Linwood Blvd.

THOMAS R. CAMP

Consulting Engineer

6 Beacon Street, Boston 8, Mass.

Water Works and Water Treatment; Sewerage and Sewage Treatment; Municipal and Industrial Wastes; Investigations and Reports; Design and Supervision; Research and Development; Flood Control.

The Chester Engineers

Campbell, Davis & Benkson

Water Supply and Purification, Sewerage and Sewage Treatment, Power Development and Applications, Investigations and Reports, Valuations and Rates.

210 E. Park Way at Sandusky,
Pittsburgh 12, Pa.

Collins Engineering Company

—Consulting Engineers—

Water Supply, Purification, Sewerage, Sewage Treatment, Refuse Disposal, Industrial Wastes, Street Paving, Storm Drainage

326 Arnote Building — 314 Gilbert Building
McAlester, Oklahoma — Ardmore, Oklahoma

DE LEUW, CATHER & COMPANY

Water Supply — Sewerage
Railroads — Highways
Grade Separations—Bridges—Subways
Local Transportation

Investigations — Reports — Appraisals
Plans and Supervision of Construction

20 North Wacker Drive — Chicago

FAY, SPOFFORD & THORNDIKE

Engineers

Charles M. Spofford
John Ayer — Carroll A. Farwell
Blon A. Bowman — Ralph W. Horne

Water Supply and Distribution — Drainage
Sewerage and Sewage Treatment—Airports
Investigations and Reports
Designs — Valuations
Supervision of Construction

Boston — New York

BUY MORE WAR BONDS

Edward A. Fulton

Consulting Engineer

Investigations, Reports, Valuations, Design and Construction—Water Supply and Purification Plants, Sewerage and Sewage Treatment Works; Municipal Paving and Power Developments.

3 So. Meramac Ave.
St. Louis, Mo.

Gannett, Fleming, Corddry & Carpenter, Inc.

Engineers

50 Broad Street, N. Y. City
Harrisburg, Penna.

Preparation of

POST WAR REPORTS and PLANS

I. M. Glace

Consulting Sanitary Engineer

WATER SUPPLY AND PURIFICATION
SEWERAGE AND SEWAGE TREATMENT

Specializing in Water Quality Problems

Telephone 6-0407 — 1001 North Front St., Harrisburg, Pa.

Greeley and Hansen

Engineers

Samuel A. Greeley — Paul Hansen
Paul E. Langdon — Kenneth V. Hill
Thomas M. Niles — Samuel M. Clarke

Water Supply, Water Purification, Sewerage, Sewage Treatment, Flood Control, Drainage, Refuse Disposal

6 N. Michigan Ave., Chicago

Havens and Emerson

W. L. Havens — C. A. Emerson
A. A. Burger — F. C. Tolles — F. W. Jones

Consulting Engineers

Water, Sewage, Garbage, Industrial Wastes, Valuations — Laboratories

Leader Building, Cleveland 14 — Woolworth Bldg., New York 7

Hayden, Harding & Buchanan

Consulting Engineers

John L. Hayden — Gordon E. MacNeill
John H. Harding — Oscar J. Campia

Waterworks, Sewerage, Civil, Mechanical, Electrical, Structural

662 Park Square Building, Boston, Mass.

Charles Haydock

Consulting Engineer

Water Works and Sanitation, Industrial Wastes, Design, Construction, Operation and Management. Reports and Valuations.

COMMERCIAL TRUST BUILDING
PHILADELPHIA 2

JONES & HENRY

Formerly H. P. JONES & CO.

Harvey P. Jones — Thomas B. Henry

Consulting Engineers

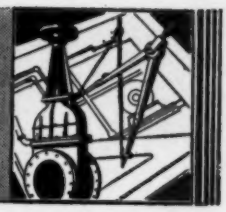
Reports, Designs, Supervision, Valuation
Water Supply — Refuse Disposal
Water Purification — Industrial Wastes
Sewerage — Flood Control
Sewage Treatment — Drainage

608 Toledo Trust Bldg. — Toledo 4, Ohio

Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE



Morris Knowles, Inc.

Engineers

Water Supply and Purification, Sewerage and Sewage Disposal, Valuations, Laboratory, City Planning

1312 Park Building, Pittsburgh, Pa.

Wm. S. Lozier, Inc.

Consulting Engineers

Wm. S. Lozier - C. E. Elmdorf - A. B. Squire
Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal

10 Gibbs Street, Rochester, N. Y.

Metcalf & Eddy

Engineers

Water, Sewage, Drainage, Refuse and Industrial Waste Problems
Airfields Valuations
Laboratory

Statler Building, Boston

MURRAY LABORATORY

25 years experience

Consulting—Analytical—Chemist—Bacteriologist. Municipal and Industrial Water Supplies

Bacteriological — Chemical — Sanitary — Mineral Analyses. Reports and Treatment Recommendations.

Capers Bldg.—Greenville, South Carolina

Nussbaumer and Clarke

Newell L. Nussbaumer **Irving Clarke**

Water Supply and Treatment
Sewerage & Sewage Disposal
Garbage Incineration
Town Planning

327 Franklin St. **Buffalo, N. Y.**

Parsons, Brinckerhoff, Hogan & Macdonald

Formerly: Parsons, Klapp, Brinckerhoff & Douglas

Engineers

Traffic Reports Valuations Harbor Works
Power Developments Industrial Buildings
Bridges Tunnels Subways Foundations
Dams Water Works Sewerage

142 Maiden Lane, New York 7
Calle Sur 17 No. 27, Caracas, Venezuela
Avenida Presidente Wilson 164, Rio de Janeiro, Brazil

Malcolm Pirnie

Engineers

Water Supply, Treatment, Sewerage
Reports, Plans, Estimates
Supervision and Operation
Valuation and Rates

25 W. 43rd St., New York, N. Y.

The Pitometer Company

Engineers

Water Waste Surveys, Trunk Main Surveys, Water Distribution Studies

Penstock Gaugings
New York, 40 Church St.

ROBERT T. REGESTER

Consulting Engineer

Sewerage—Sewage Treatment
Water Works—Industrial Wastes
Flood Control—Fire Protection

Advisory Service, Reports and Designs

Baltimore Life Building
Baltimore, Md.

Thomas M. Riddick

Consulting Engineer and Chemist

Municipal and Industrial Water Purification, Sewage Treatment, Operating Supervision of Plants, Sanitary Surveys, Stream Pollution Investigation, Swimming Pool Control, Chemical and Bacteriological Analyses, Testing of Materials.

369 East 149th Street, New York City

ROBERT AND COMPANY

Incorporated

Architects and Engineers

ATLANTA, GEORGIA

Water Supply Incinerators
Sewage Disposal Power Plants

Russell & Axon

Geo. S. Russell—John C. Pritchard
Joe Williamson, Jr. — F. E. Wenger

Consulting Engineers, Inc.

Sewerage, Sewage Disposal, Water Works, Filtration, Softening
Power Plants

6635 Delmar Blvd University City 5, Mo.

J. E. Sirrine & Company

Engineers

Water Supply & Purification
Sewage & Industrial Waste Disposal
Stream Pollution Reports
Utilities, Analyses

Greenville **South Carolina**

Benjamin L. Smith & Associates

Engineers

(Formerly Whitman and Smith)

Investigations — Reports
Designs — Supervision — Valuations
Municipal Engineering and Public Utilities

11 North Pearl Street
Albany 7, New York

STANLEY ENGINEERING COMPANY *Consulting Engineers*

Water Works — Sewerage
Electric Power — Flood Control
Rate Studies—Valuations—Industrial
Airports . . . Municipal Buildings

Central State Bank Bldg., Muscatine, Ia.

Westcott & Mapes, Inc.

Architects and Engineers

Sewage Disposal
Garbage and Refuse Incineration
Public Utilities
Reports Plans Specifications

NEW HAVEN **CONN.**

Weston & Sampson

Water Supply, Water Purification, Sewerage, Sewage and Industrial Waste Treatment, Corrosion Control, Laboratory Service, Supervision, Valuations

14 Beacon St. **Boston, Mass.**

Whitman & Howard

Engineers (Est. 1869—Inc. 1924)

Channing Howard Paul F. Howard
Walter A. Janvrin C. Roger Pearson

Water Supply, Water Purification, Sewerage, Sewage Disposal, Water Front Improvements and all Municipal and Industrial Development Problems, Investigations, Reports, Designs, Supervision, Valuations.

89 Broad St., Boston, Mass.

WHITMAN, REQUARDT AND ASSOCIATES

Engineers — Consultants

Civil—Sanitary—Structural—Mechanical—Electrical. Reports, Plans, Supervision, Appraisals

1304 St. Paul Street
Baltimore 2, Maryland

Back Volumes Wanted

If you have 12 complete issues of Water Works & Sewerage for any year, or bound volumes, please give us the years and the price you would be willing to accept per volume.

Circulation Department
Water Works & Sewerage
330 South Wells Street
Chicago 6, Illinois

TROY, ALABAMA

Now Has a Layne Automatic Water System

City Officials of Troy, Alabama are in high spirits these days. Where all others have failed, Layne has just completed a water system WITHIN THE CITY LIMITS that produces over 1,000,000 gallons daily. Furthermore this new system is equipped with the latest automatic control device which eliminates manual starting and stopping.

Prior to the completion of this New Layne System, all water for the city of Troy was obtained from wells located some three miles away. The success achieved by Layne will now enable the city to install other wells and thus abandon the distantly located and expensive to operate system.

Here again is proof that Layne's experience, knowledge and specialization always pays handsome dividends. Building this well was no easy task. It was drilled through rock strata from one to sixteen feet in thickness. Some five-hundred bags of cement were used to seal off all but the desired water bearing sand formations.

Layne is now almost entirely engaged in civilian Well Water System building—and is ready to serve you. Write, wire or phone for further facts, catalogs, bulletins etc., LAYNE & BOWLER, INC., General Offices, Memphis 8, Tenn.

LAYNE PUMPS *—fulfill every need for producing large quantities of water at low cost from wells, streams, mines or reservoirs. Send for literature.*

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada * Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Index TO ADVERTISERS

Albright & Friel, Inc. 98
Allen Billmyre Co. 79
Alvord, Burdick & Howson 98
American Brass Co. 6
American Cast Iron Pipe Co. 79
American Radiator & Standard Sanitary 91
American Well Wks. 28
Anthracite Equipment Co. 90
*Atlas Mineral Products Co. of Pa., The 87
Aurora Pump Co. 79

*Bailey Meter Co. 91
Baker, Jr., Michael 98
Black & Veatch 98
Bogert, Clinton L. 98
Bridgeport Brass Co. 17
Buck, Seifert and Jost 98
Buffalo Gasolene Motor Co. 80
*Builders Iron Foundry 7
*Builders-Providence, Inc. 7
Burns & McDonnell 98
Byers Co., A. M. 13

*Calgon, Inc. 73
Camp, Thos. R. 98
Carter Co., Ralph B. 38
Cast Iron Pipe Research Assn. 8
Cement Gun Co. 87
Centriline Corp. 4
Chain Belt Co. 84
Chester Engineers, The 98
*Chicago Bridge & Iron Co. 5
*Chicago Pump Company 3
Clayton Mfg. Co. 83
Collins Engineering Co. 98
Cooper-Bessemer Corp. 37

Darco Corp. 93
Dearborn Chemical 29
De Laval Steam Turbine Co. 39
DeLeuw, Cather & Co. 98
Diamond Alkali Company 35
Dorr Company, Inc., The ....Third Cover

Eddy Valve Co. 93
Edson Corporation, The 97

Fay, Spifford & Thorndike 98
Fisher Research Laboratory 95
*Flexible Sewer Rod Equipment Co. 77
*Flexible Underground Pipe Cutting Co. 77
Ford Meter Box Co. 94
Fulton, Edward A. 98

Gannett, Fleming, Cordy & Carpenter, Inc. 98
General Chemical Co. 20
General Electric 26-27
*General Paint Corp. 86
Glace, I. M. 98
*Golden-Anderson Valve Spec. Co. 97
Gorman-Rupp 40
Grancell, I. H. 91
Greeley & Hansen 98
Grinnell Co. 85

Havens & Emerson 98
Hayden, Harding & Buchanan 98
Haydock, Chas. 98
Hays Mfg. Co. 74
Hellige, Inc. 95
Hill, Hubbell & Co. Division 86
Homelite Corp. 16
*Hooker Electrochemical Co. 77
Hydraulic Development Corp. 91

*Industrial Chemical Sales 9
*Infilco, Incorporated 87
*Innis, Speiden Co. 89
Iowa Valve Co. 90

Johns-Manville 18-19-34
Jones & Henry 98

Knowles, Inc., Morris 99

Lakeside Engineering Corp. 96
Layne and Bowler, Inc. 100
Leadite Company 97
Leopold Co., F. B. 96
Leupold & Stevens Instruments 21
Lock Joint Pipe Co. 25
Lozier, Inc., Wm. S. 99
Luther & Wood 96

Mathews Hydrants 21
Mathieson Alkali Wks., Inc. 21
Metcalf & Eddy 98
Mueller Co. 96
Murray Laboratory 99

National Clay Pipe Mfrs., Inc. 22
*National Water Main Clean. Co. 94
Neptune Meter Company 44
Niagara Alkali Co. 11-12
Norwood Engr. Co., The 82
Nussbaumer & Clarke, Inc. 99

Omega Machine Co. (Division of Builders Iron Fdry.) 92

*Pacific Flush-Tank Company 96
Parsons, Brinckerhoff, Hogan & Macdonald 98
Peerless Pump Division (Food Machy. Corp.) 78
*Pennsylvania Salt Mfg. Company ..... Second Cover
Phipps & Bird, Inc. 15
*Philadelphia Quartz Co. 81
Pirnie, Malcolm 98
Pitometer Co., The 98
Pittsburgh Equitable Meter Company 96
Pittsburgh-Des Moines Steel Co. 23
Portland Cement Ass'n 26
*Proportioneers, Inc. 42

Regester, Robt. T. 98
*Rensselaer Valve Co. 88
*Riddick, Thomas M. 98
Ridge Tool Co. 75
Robert & Co. 99
Roberts Filter Mfg. Co. 91
Rodney Hunt Mach. Co. 97
*Roots-Connersville Blower Corp. 76
*Ross Valve Mfg. Co. 92
Royer Fdry. & Mach. Co. 41
Russell & Axon 98

Simplex Valve & Meter Co. 75
Sirrine & Co., J. E. 98
Smith Co., S. Morgan 94
Smith & Associates, Benj. L. 98
Smith Mfg. Co., The A. P. 83
Stanley Engineering Co. 98
Stuart Brumley Corp. 94

Tapax Mfg. Co., Inc. 90
Tate Pipe Linings, Inc. 88
Taylor & Co., W. A. 96
*Tennessee Corp. 92
Thomson Meter Company 44

U. S. Pipe & Fdry. Co. 10

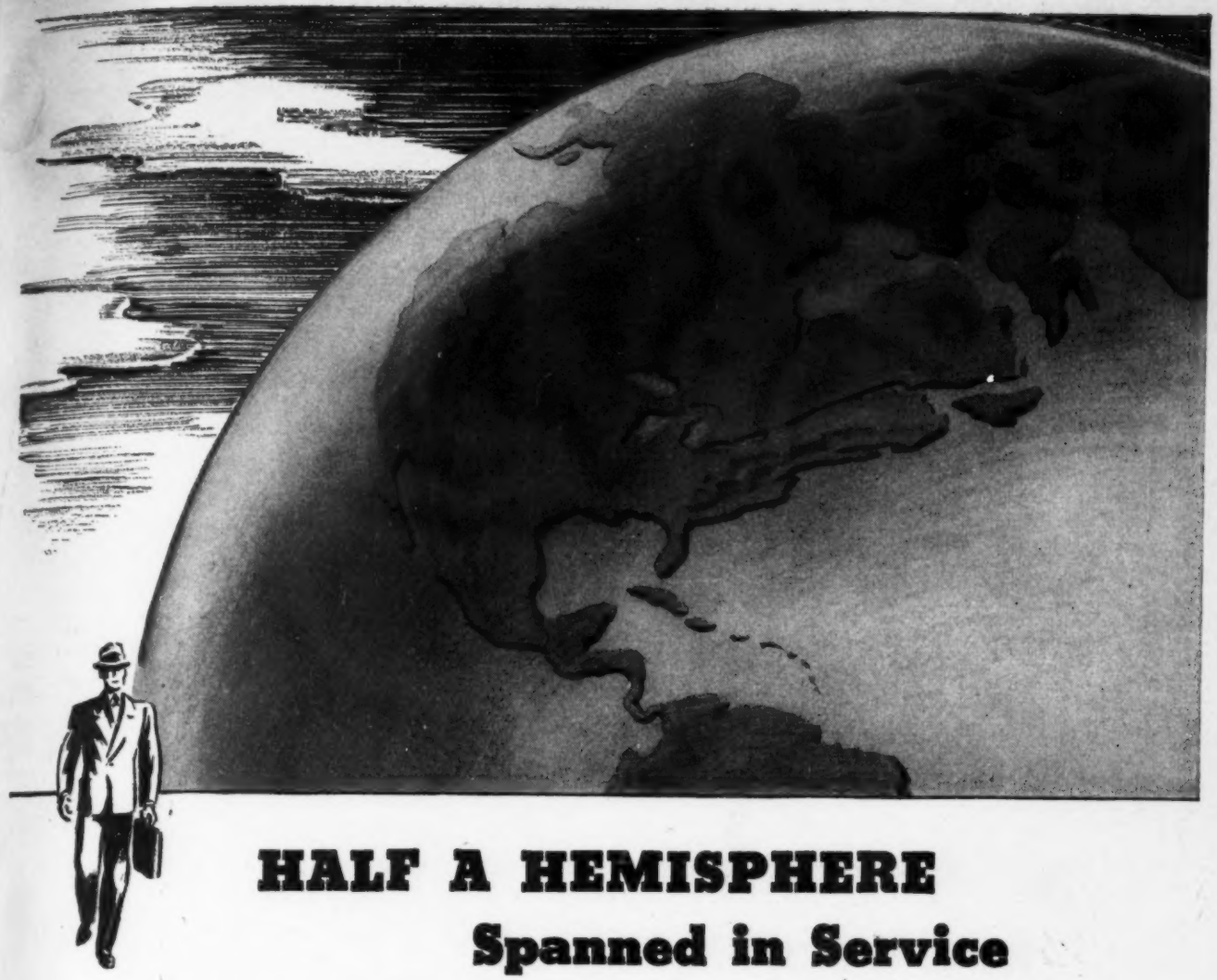
Virginia Smelting Co. 97
Vogt Brothers Manufacturing Co. 94
Vogt Manufacturing Co. 94

*Wallace & Tiernan Co., Inc. ..Back Cover
Warren Foundry & Pipe Corp. 87
Wescott & Mapes, Inc. 98
Westinghouse Electric Corp. 14-15
Weston, L. A. 88
Weston & Sampson 99
Whitman & Howard 99
Whitman, Requardt & Associates 98
*Wilson Chemical Feeders, Inc. 94
Wood Co., R. D. 24

Yeomans Bros. Co. 26

Zeolite Chemical Co. 95

*Advertisers with * were represented in the June, 1945, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.



HALF A HEMISPHERE
Spanned in Service

To users of Dorr equipment in all fields throughout the North American Continent, The Dorr Company offers quick, expert, engineering service... to a water works in Mexico, a sugar central in Cuba, a sewage disposal plant in Newfoundland, a paper mill in Quebec or a gold mine in Alaska.

The Dorr Company maintains a staff of thoroughly trained engineers at strategic points throughout *half a hemisphere* to render immediate service wherever and whenever needed... service in all fields to all Dorr installations whether they consist of a single piece of equipment or a complete process plant.

This extensive service is the direct result of a fundamental sales policy of The Dorr Company—Dorr takes the view that it sells not merely equipment but *the solution to the problem for which the equipment is intended.* Therefore, Dorr's interest in the purchaser does not end at the time of installation but continues far beyond. Dorr equipment provides an efficient, economical solution of the client's problem.

Avail yourself of Dorr's comprehensive knowledge of a wide variety of fields; gain the advantage of the service of Dorr engineers; take up your process equipment problem with The Dorr Company.

Ⓓ 8122

DORRCO

THE DORR COMPANY, ENGINEERS

NEW YORK 22, N. Y. . . 570 LEXINGTON AVE.
ATLANTA 3, GA. . . WILLIAM-OLIVER BLDG.
TORONTO 1, ONT. . . . 80 RICHMOND ST. W.
CHICAGO 1, ILL. . . . . 221 NO. LA SALLE ST.
DENVER 2, COLO. . . . . COOPER BUILDING
LOS ANGELES 14, CAL. . . . 811 WEST 7TH ST.

RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.

SUGAR PROCESSING
PETREE & DORR DIVISION
570 LEXINGTON AVE., NEW YORK 22, N. Y.

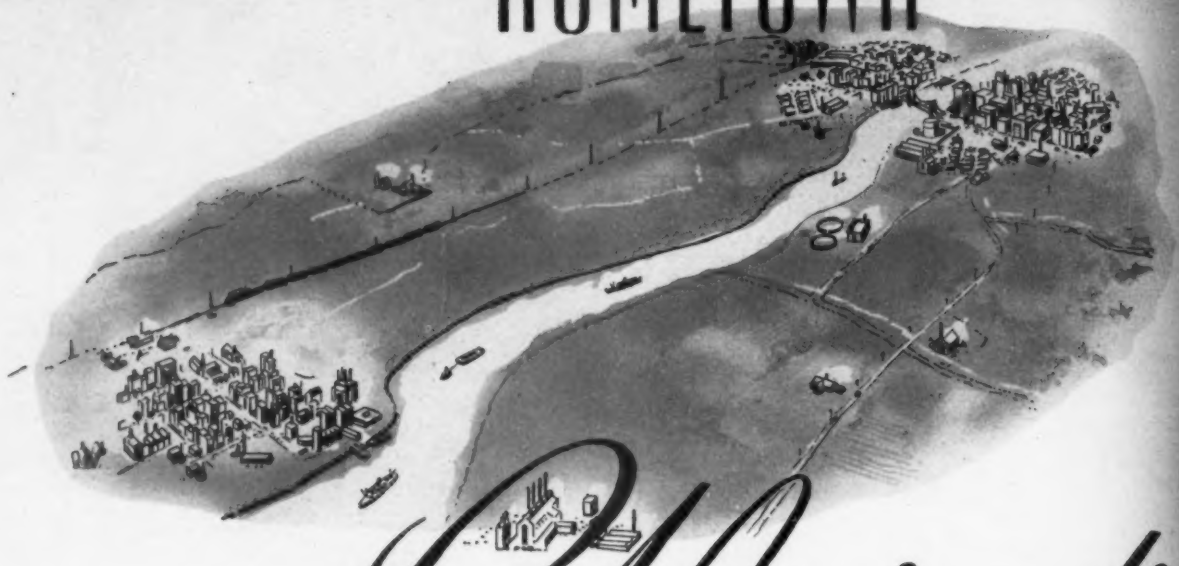
Blueprint Ready!

DORR

RESEARCH [illegible] EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

DON'T OVERLOOK HOMETOWN BENEFITS



OF EFFLUENT *Chlorination*

If chlorination of sewage effluent seems a ***responsibility without return*** to your hometown, consider some of the benefits available to towns and cities using W&T Chlorinators.

Community income is increased through expanded opportunity for downstream bathing and camp sites.

Industry is attracted by adequate process and cooling water low in slime producing organisms.

Public health protection is increased for farms and rural or suburban settlements along the waterway and the possibility of damage suits is reduced.

A perfect no-pollution record gives weight to your own requirements, and assures leadership in joint efforts to clear up badly polluted streams.

Wallace & Tiernan engineers will be glad to discuss with you these, and other, advantages of effluent chlorination in connection with your current or post-war plans for sewage treatment. SA-179

"The Only Safe Sewage is a Sterilized Sewage"

WALLACE & TIERNAN COMPANY, INC.

MANUFACTURERS OF CHLORINE AND AMMONIA CONTROL APPARATUS

NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES